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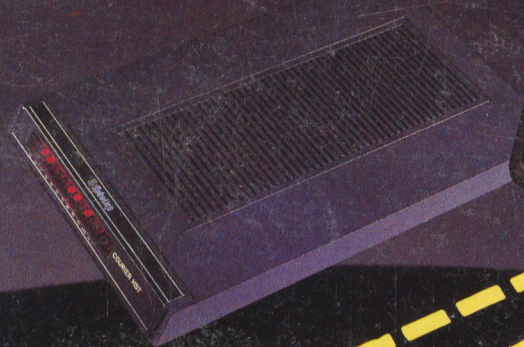
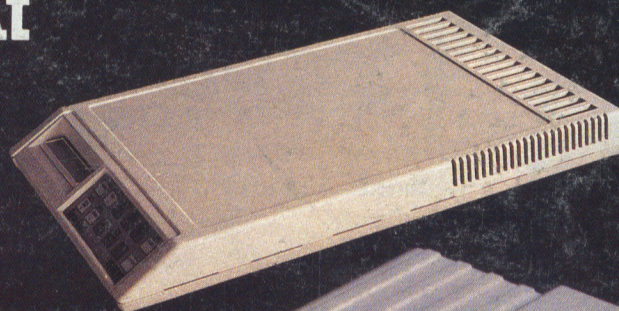
COMPUTER SHOPPER[®]

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IBM's VGA-
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● IBM's VGA—Picture Perfect

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ATARI ST

Hacking The ST

by Wynn A. Rostek

Time again for some views from the foxhole. The last couple of months have been very busy, but I have managed to play with my computers a little bit in spite of the demands on my time.

On the ST, I've had a chance to work with the Mark Williams C compiler for about 6 weeks. While I had been using the Alcyon C compiler included in the developers kit as my main C compiler on the ST, that has changed.

Mark Williams C is not perfect, and it's not for everyone, but I have found it to be a very acceptable package. I have to point out the package in the last sentence, because Mark Williams C is much more than a compiler.

A superficial look at the Mark Williams C compiler shows that you get 4 floppy disks and a 737 page manual. In itself this appears to be a fair amount of stuff for your money, but it's what is packed inside that really makes Mark Williams C different.

Included with the package is an editor, (Mark Williams own version of micro EMACS) a shell, the compiler, (including an assembler and linker) example programs, and a host of utilities.

To give you some idea of the completeness of the package, the table of contents for the manual is over 20 pages long!

I'd like to spend a little time on the manual because computer documentation is the one thing that everyone agrees on, and everyone agrees that it stinks!

Poor documentation is the most common complaint I hear, and not just from home computer owners and casual users, but from professional programmers, too.

Computer documentation usually falls into one of two categories. The first type of computer documentation, the one I'm sure everyone is familiar with is the plug and go document.

The plug and go document is found with hardware and simple software packages. The contents of the plug and go document boils down to "plug it in and watch it go."

While this kind of documentation is common for add-in boards for the PC (by which I mean the IBM PC compatible) it is not restricted to hardware that came from overseas.

Software also often features plug and go documentation. The software version of plug and go includes 4 pages of backing up the disk if the disk is not copy protected. You find this kind of documentation with most games, but I have run into it even with C compilers!

The second type of computer

documentation is the maze document. Unix documentation is the classic example of maze documentation.

Maze documentation usually comes in 5 or more volumes. The information is presented in a dense, highly technical manner, and entries always reference other entries that reference other entries...

The problem with maze documentation is two fold. The first problem is the worst, you know the information you need is in there somewhere, but finding it is almost impossible.

The second problem is that once you find an entry of interest, you will very shortly have all 5 volumes spread out across all available surfaces, with tens, perhaps even hundreds of paper clips marking sections of interest.

Finding something in maze documentation is like a little Adventure. Maze documentation is designed so that the secret knowledge contained in the manuals is revealed bit by tidbit as you follow a twisted trail through far away, exotic lands (the other volumes of the manuals).

It doesn't surprise me in the least that the original text Adventure games were so popular with programmers. After using typical system documentation for a while, the mazes and puzzles of Adventure games are familiar friends to programmers everywhere.

Getting back to the subject at hand, at 737 pages you might expect that Mark Williams has taken a standard set of maze documentation and just put all the volumes in a single book, but that's where you would be wrong.

The first 28 pages of the manual are an introduction to the Mark Williams package including a brief introduction, (about a page) a run down on changes since Release 1.1, a section on how to use the manual, information on technical support, installation instructions, and an introduction to the shell and several utilities.

Next you have 9 pages that cover compiling, linking, the assembler, debugging and a few related topics. After that you have 37 pages on using MicroEMACS.

MicroEMACS is a very serious editor for programmers. It is not a word processing program, but a text editor that is superb for editing source files.

I have been using one or another version of EMACS for about 7 years now, and I wouldn't trade any of the EMACS like editors for Word Perfect, WordStar, or whatever the popular word processing package of the day is.

Word processing packages come and go, but EMACS like editors just keep slowly gaining in popularity as time goes on. And for good reason!

Back in the days when WordStar

made you go through all sorts of strange motions to move a section of one file into another, Mince, an EMACS like editor, was a multi-window, multi-buffer editor that ran under CP/M.

MicroEMACS is a public domain EMACS like editor that is available on a wide variety of machines. Mark Williams modified the program so that when the compiler encounters a problem, you pop into the editor with the cursor positioned at the error and a second window contains the error messages. To get this "Turbo Pascal" like feature, you just compile with the -A option.

Mark Williams version of MicroEMACS is set up so that you can execute shell commands from within the editor. This means that in the middle of an edit, you can duck out and see if a file name is in use, or even try to compile a program all without leaving the editor.

Although I'm fond of the ability to go directly to the line causing problems, there are enough differences between Mark Williams version of MicroEMACS and MicroEMACS 3.9I that I tend to avoid Mark Williams version.

The delta's are minor, but since I use MicroEMACS 3.9I under DOS 3.2, and under UNIX 80386, it's just easier for me to use it on the ST under TOS. (There is a very real advantage to having the source code to your editor.)

There is enough common ground between all the EMACS derived editors that I can move from one to another with little problem, and the Mark Williams version is a very nice implementation. I think most people would find it a joy to use.

The next section of the manual introduces you to that favorite UNIX

continued on page 305

Atari ST News And Comment

by John Nagy

Starting this month, and with any luck at all, from now on, you can find the latest news of Atari and Atari products here in *Computer Shopper*. My column in the 8-bit section used to include ST information as well, but since it was hard to find for some readers who really were exclusively "ST People," now look for two articles, one in each section. There will be a few Bits of overlap (sorry about the pun), but be sure to read both if you want to stay up to date on all the Atari news.

New Products Announced (the latest vaporware)

CD-ROM: Atari announced their Compact Laser Disk Memory device at Britain's Personal Computer World Show in September. "To be shipped by Christmas," it will hold up to 540 MEG per disk (that's over 1,000 floppies!), will play audio CD's, will play up to an hour of Video, and sell for under \$600. (Christmas in what year? Not '87 anymore!)

Atari PC-2: Even before the PC-clone (now dubbed PC-1) makes it out, a new one is announced. This time an AT-clone with Slots.

A 10-MIP (million instruction per second) Unix-like graphics workstation for under \$5,000. Called the ABAQ, it should give ten times the power of an IBM-AT. Shown at the November Comdex show, it is hoped for production in mid '88 for marketing initially in the Atari-favorable atmosphere

overseas. The price is high to use home-types, but dramatically below anything similarly available today.

The IBM Hardware Emulator Box for the ST is on the front burner again at Atari. If released, it will likely be faster than a normal Clone and perhaps more versatile than the PC:DITTO package. Still, PC:DITTO is hard to beat at the price (see below).

Local Network: Unbelievably named "Moses PromisLan," Atari promises a cheap and effective interface for both ST and "common IBM" machines.

Atari Stockwatch: Surviving Bloody Monday and the aftershock, Atari stock is at this writing at \$6.00, down by more than half of only a couple of months ago. Still, it nets out to over 10% growth in the year since Atari went public, and we all expect at least some recovery of the market. However, Atari's fall purchase of Federated electronics stores with excess on hand capital may prove to have been ill-timed, as massive stock market downturns generally result in reduced consumer spending—and had Atari waited, Federated might have been a real steal about now. (Atari had a few million sitting around with nothing to do, so they bought their own chain store. Federated, a west-coast electronics chain, lost a few mils last year, and Atari figures to do better at the helm. Well, this is one way to get Atari products into the stores...)

continued on page 306

MSDOS For Your Atari ST

by W. Krieger

One thing ST owner's hate to admit is that the microcomputer world is a PC-DOS/MSDOS world. Given half a chance they will go into great detail on why the ST line is not just as good as any PC or clone but is actually better than most. I know I'm one of them and truth to tell the ST has a lot going for it. But deep in my heart I have to admit that I lust after the MSDOS software library. And I know a lot of my ST cohorts have the same secret desire, if there was only some way to get that software on our machines.

In my case the desire became too strong to avoid when a friend gave me an XT motherboard and a power supply. He had upgraded his system to a turbo mother board, and no longer needed his old one. I'm not really sure how he came to have an extra power supply. However he got it he was kind enough to let me have them. Boy I had it made with these parts my clone was almost complete all I needed to do was sit down with a telephone, a copy of *Computer Shopper* and a credit card and I was in business. Yep I bought me an almost free clone why all I spent was \$100 for a mono monitor, \$100 for a mono graphics card, \$35 for a case, \$50 for a keyboard, \$150 for a multi-function card, \$150 for a pair of floppies, \$325 for a hard drive and controller, \$100 for a color graphics card, and \$300 for a color monitor. Yes sir with friends like Wynn and \$1310 you too can have a free MSDOS system.

Now I know there are not enough good buddies like Wynn out there to

give all ST owners their own "free" clone like I got. Be that as it may, these ST'ers still want to get there hands on and use all that MSDOS software. Well now there is a slightly cheaper alternative to buying your own clone, it's even less expensive than my "free" clone. It's called pc-ditto, (Avant-Garde Systems, 381 Pablo Point Dr., Jacksonville, FL 32225) and it's a program that allows your Atari ST to emulate an IBM PC. pc-ditto sells for \$89.95, this is a 100% software emulation you don't need to buy any additional hardware just a color ST with at least one drive. This is of course a whole lot cheaper than getting into your own clone "free" or otherwise.

The first question that I had about pc-ditto was, does it work? I had already seen one MSDOS emulation that didn't work all that well. And I'd heard about but never seen Atari's efforts to get the ST to run MSDOS. So I was somewhat wary of the program. The good news is it does work, indeed the list of software certified by Avant-Garde to run under pc-ditto is huge. Listing just about every major product I am familiar with including Word Perfect, Lotus 1-2-3, dBase II, III, III plus, and Flight Simulator to name a few.

After reading these impressive claims at the computer store I couldn't wait to get home and try out pc-ditto for myself. Setting up the program is a simple and straightforward process. First run the configuration program to choose graphics mode either MGA or CGA, plus a few other options. One thing I need to point out here is that

the current version of pc-ditto requires a color monitor. While it will run MGA mode on your color system pc-ditto will not run on a monochrome ST. Also I am a little disappointed there is no EGA mode. ST graphics are much closer to EGA than they are to CGA. But if you want color with pc-ditto CGA is your only choice.

Now just double click on the pc-ditto.prg icon and in a few seconds you will be prompted to load in your copy of MSDOS. In order to use this program you need a copy of MSDOS or PC-DOS on a 3.5" disk. The pc-ditto program just makes your ST emulate the hardware of an IBM PC getting the DOS is up to you. Not that this is a big problem, with the advent of the PS/2 line and the popularity of lap tops getting DOS on a 3.5" disk isn't difficult. To be legal you will need to buy a copy, neither MSDOS or PC-DOS are public domain. If you have a 5.25" drive hooked up to your ST you of course don't need to get DOS on a 3.5, but you still need DOS.

Now that you got DOS loaded you can run PC programs on your ST. That is if you can get PC programs over to your ST. Software on 3.5's is becoming more and more available but for now 5.25" is the standard. So the pc-ditto user is faced with two options either drop some bucks on a 5.25" drive for the ST or find a way to copy programs and files from a 5.25 to a 3.5.

Luckily for me I had been down this road before when I needed to get some stuff from my clone to a lap top I was using. I transferred these files us-

ing my clone and my ST. What makes this possible is that the ST and the IBM 3.5" disk formats are physically identical. The only difference between the two is that the IBM writes some information in track 0 of 1 (can't remember which) that the ST doesn't. What this ends up meaning is that the ST can read and write to disks that are formatted by an IBM or compatible, though the IBM can't use disks formatted on the ST unless this information is added.

pc-ditto provides a couple of support programs to format 3.5's to the IBM standard. Once you have these the rest is a gimmie. Just use your favorite ST telecommunication program to download files from a computer using a null modem cable, from a BBS, or from one of the commercial time share systems like GENIE or CompuServe. Your ST will have no problem writing these files to IBM formatted 3.5's which can then be utilized via pc-ditto. Of course if you want to run copy protected stuff, (terrible idea copy protection, which reminds me pc-ditto isn't copy protected a big plus from my point of view). Like Lotus your best bet is to get a 5.25" drive for your ST.

O.K. now I'm cooking with gas. I got my ST running MSDOS 3.2 and I have some of my favorite software ported to 3.5" disks. Visions of moving all my computing over to the ST are dancing in my head. Let's see now if I sell my clone that should give me enough money to buy a big hard drive for my ST, and the Mac emulator cartridge. That along with the CP/M emulator I already have and pc-ditto and I can run any software I'm likely to want for a long time. Four machines in one, what a deal.

Well if your looking for a good deal in a used clone, don't call me. I'm hanging on to mine for a while yet. pc-ditto has got a serious problem. I'll give credit where it's due and say here and now that every PC program I tested pc-ditto with ran.

There are some minor problems with screen handling I ran into. In Turbo Pascal I had written a short little benchmark program that used the predefined function ClrScr (clear screen), this function didn't work under pc-ditto but that alone isn't serious. The rest of the program worked and there is an easy work around for this problem.

I also ran into minor screen handling problems with a game I tested "Leisure Suit Larry in The Land of the Lounge Lizards." This game writes messages to the player in the form of pop up windows, while both the messages and the windows appeared when running the game under pc-ditto. The text is printed off to the left side of the window that it should be centered in. Again no major problem but a little disappointing.

The serious problem is in how slow programs run using pc-ditto. I'm talk-

WordPerfect 4.1 For The Atari ST

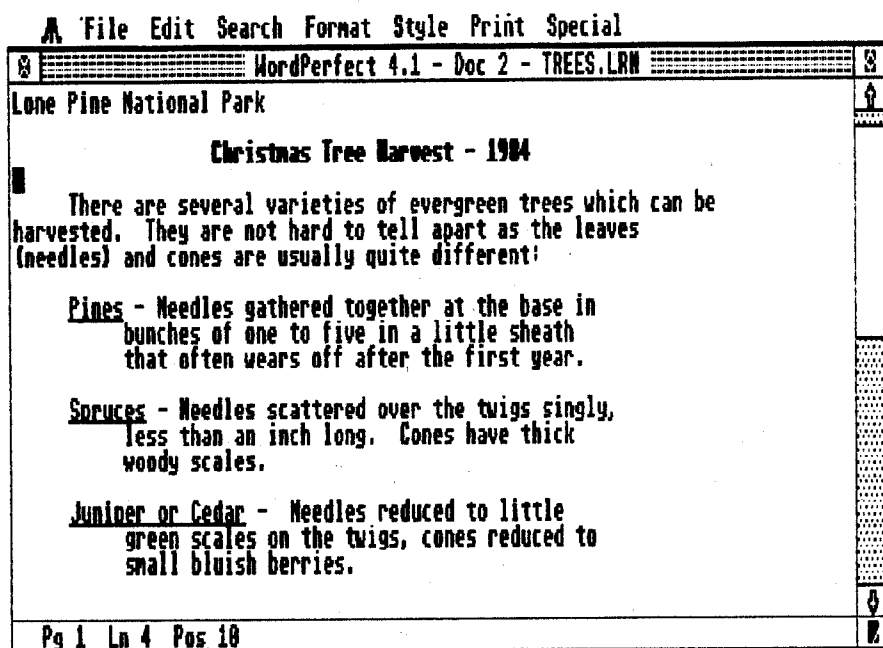
by Randy Holcomb

After many months of anticipation WordPerfect for the Atari ST has arrived. Hot on the heels of Comdex, WordPerfect began shipping Version 4.1, and already it has been met with both praise and numerous bug reports. By the time you read this, the

second minor release should be out the door and in your dealer's hands. With this introduction the Atari ST gets a much needed boost in word processing: a true, full-fledged, knock-down and dragged-out piece of software (with a price tag to match almost as much as a 520STM console).

WordPerfect for the ST comes on six

diskettes, titled WordPerfect, Thesaurus, Learn, Spell, Font and Printer, and comes in an IBM-Style binder, with a very detailed manual. Those of you familiar with other versions of WordPerfect should not have any trouble adapting yourself to the ST version. Likewise, if you have never used a full-featured word processor of the class of WordPerfect, some caution is advised. You can easily get lost during the Installation process; especially during the definition of the printer types. I eventually had to reinstall the printers because I messed things up during install. It is probably worth your time to go over the installation and "Learning" sections of the manual before you do anything serious with WordPerfect. That way, you'll get a better feel for what it is capable of doing and you'll quickly learn which items perform what functions. Of course, should you run into trouble the HELP key is always there (which also tells you which version of WordPerfect you are running in the upper right-hand screen) as well as the manual. As a last-ditch effort, help is available directly from WordPerfect Corporation from their Technical Support Center numbers.



WordPerfect Text

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CLASSIC COMPUTERS

COMMODORE

C128 80-Column Magic

by Edward Corr

As more and more information about the Commodore 128 80-column screen becomes available, unexpected power—and remarkable new possibilities—keep emerging. For example, “ultra high resolution” graphics (640x200 pixel) are indeed achievable, with some additional programming effort. Multiple screens can be held in memory at one time, especially if you have the 128-D, or if you have added video RAM per Ted Drude’s article in *Computer Shopper* January ’87 issue (page 207). You can even mix text and bit-mapped graphics on the same screen. Professional software that takes advantage of these features are also appearing, GEOS 128 and BASIC 8 are two that come to mind.

Well, guess what? That’s only the beginning! The 128 is, after all, a brand new machine. It just happens to also run 64-based software. Remember when the 64 first came out, and how wonderful it’s graphics seemed at the time? Compare those pictures with what is being accomplished on the 64 now.

I feel that a similar evolution awaits the 128, including it’s graphics capabilities. New ideas about how to utilize the 128’s lesser-known features are coming, and the best ones probably haven’t even been dreamed of yet. Let’s dive into a couple of the interesting things that you can already do with the versatile 80-column screen.

More Than 25 Lines

You can command the 128’s Video Display Controller (VDC) to display MORE than the normal 25 lines on-screen. It’s easy; in normal BASIC direct mode, just type:

```
COLOR 5,7:COLOR 6,2:SYS 52684, 26, 6
```

Notice the pattern of “commercial AT” symbols (“@”), letters, etc. at the bottom of your screen? There appear to be gaps between them, so now type:

```
COLOR 6,14 [RETURN]
```

If your system behaves like mine, you should find that they weren’t gaps at all, but white characters—and flashing. Now, fill the screen with anything, a program listing for instance. Count the number of lines visible, scroll the screen, even clear it. That bottom line stayed put, didn’t it? And it is a true line number 26, not interfering at all with the rest of the screen activity.

Experiment with numbers higher than 26 in the SYS command, and find out just how many lines your screen will display. Now let’s see if we can

squeeze in one more line. Carefully note where the top line of your display appears on the monitor’s screen. Type: `SYS 52684,30,7 [RETURN]`

Did you notice that your lines moved up slightly on the screen, leaving some more space at the bottom of the display? Experiment with numbers slightly higher than 30, and see how much room you can make at the bottom. Be careful that you don’t lose a line off the top of the screen! (32 was the highest I could go.) Go back to the first `SYS...6` command; see if you can increase the middle number by one or two, and still get all lines comfortably visible.

If you can adjust Vertical Size or have a Screen Compression switch on your monitor, try them also. My monitor is a Sears TV/Monitor that supports RGB and composite inputs, and does have the compression feature. With compression ON, I can very clearly display 30 (THIRTY!) complete lines.

`SYS 52684, 25, 6:SYS 52684, 29, 7` = will get your normal size display back, in it’s normal place on the screen.

Permanent Command Line(s)

So why would anyone like more lines on-screen? My reason was to be able to create a constant display of custom function key definitions. I typically use 5 of the 8 function keys regularly, and the remaining 3 only occasionally. And I find that I forget exactly which of those last 3 keys has been assigned what function. (I switch quite often between the 128’s native BASIC and the CP/M mode.) If you are familiar with other computers and their software, it is common for a Command Line or a Key Definition line to be on-screen all the time. I wanted the same “reminder” on my 128, even while running programs. And naturally I didn’t want to lose any valuable screen display area; that would be too much like all the “other” computers.

Additional uses for an extra screen window could include a Status line that shows program variables and messages, or a constant interrupt-driven digital clock display, or ... Be creative! Use the accompanying example program as a template for creating up to 3 new constantly displayed lines of information.

Monitor Requirements

Since we are dealing exclusively with the 80-column screen of the 128, you must be using either an RGB monitor, or a composite monitor tied into the monochrome 80-column line.

As I mentioned earlier, Screen Compression and vertical positioning the display via the SYS command, gave me a maximum of 6 additional lines. Without compression, I was still able to get two additional lines with only the SYS software adjustments. Find out what works best on your equipment, and simply make the appropriate changes as you work with the example program in Listing 1.

VDC Overview

Before going on, let’s briefly review the 128’s Video Display Controller (VDC). This integrated circuit (IC) is dedicated exclusively to the 80 column screen, until someone discovers differently. The 128 system has two other ICs whose only purpose is to provide memory for the VDC. In fact, the only way to access this special memory is through the VDC itself.

Even the VDC and the way it receives instructions is unique. There are only two memory addresses that you can use to talk to the VDC, or to deal with it’s personal memory space.

But powerful! The VDC is one of the most programmable, and therefore versatile, video control ICs available on ANY computer. You have control not only of what character, in what color, from which character set, but also of details such as pixel size of the character, total number of horizontal and vertical characters, the blank space between lines of characters, and much more.

Since a complete discussion of the VDC is a book in it’s own right, look to the references for specific details that I don’t cover here.

The point of all this is that most articles I’ve seen imply that the only effective way to take control of the VDC is via machine language. That is certainly valid for large graphics screens, animation, or any heavy computation load. But for utility use, as I’m about to show, BASIC handles the task very nicely. “Mapping the Commodore 128,” together with the other references, provided several of the

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ATARI

Applying The Atari

by Jeff Brenner:

Welcome to another month of “Applying The Atari” for your 8-bit Atari computer. February’s column brings with it the buildup of holiday mail, particularly the questions and reader requests. This month we’ll take a look at some reader mail and some reader requests that you may be able to help with.

Reader Mail

Dear Jeff:

The “Applying The Atari” column in the October 1987 issue of *Computer Shopper* included a program for converting an English input to a decimal number. The first example on page 348 states:

```
You Type: Two Hundred Sixty-Three Thousand
```

```
Computer: 163,000.00
```

Now that is exactly the kind of program we don’t need. I presume that a misprint is involved.

Palmer O. Hanson, Jr.
Largo, Florida

The misprints always manage to pop up in the most critical places, such as in typeset program listings and output examples. (*Compter Shopper* now directly reprints program listings instead of typesetting them, thank goodness.) You along with more than a dozen other readers caught the error and wrote in. The misprint occurred during typesetting of the output sheet I submitted. The program does

work properly, however, and will output the correct response. The example should have read:

```
You Type: Two Hundred Sixty Three Thousand
```

```
Computer: 263,000
```

Now I hope the typesetting department gets those lines correct, or I’m going to have a lot more explaining to do.

Dear Jeff:

Thank you for including my question concerning a driver for using the Atari Trakball. Enclosed is an article from the Spring 1984 issue of *Atari Connection* magazine. Can this be modified to numerically display acceleration and angular position?

Also, beginning in January 1985 Earl Rice wrote a four-part article on the Parallel Bus Interface Revealed in *Antic* Magazine. I wrote to him in care of *Antic* with no reply. How can I get in touch with him? Also he refers to some technical notes released by Atari specifically on the PBI; where can these be purchased? Maybe one of your readers can help!

John Palhof
West Palm Beach, Florida

A number of readers had sent me this article, “Tracking Your Trak-Ball,” by Bill Bartlett, after your request appeared. (The *Atari Connection* was the old name for the *Atari Explorer*.) The article discusses how the Porta register (location 54016, \$D300)

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COMMODORE

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included a bonus for folks who also use the 40-column screen, but would still like the fixed on-screen line(s).

Now for details about the program listing and how to interpret the special key-codes. (As you type in the program, feel free to skip the REM statements. Just be mindful of their contents and suggestions.)

The program includes the need to use many of Commodore's special key-codes to perform various functions. For example: cursor movements, color changes, graphics characters, and more. Rather than force you to decode the cryptic characters that represent these codes, as you would see in a normal program listing, Listing 1 uses appropriate abbreviations that I hope you will find easier to recognize.

All abbreviations are inclosed in curly brackets, for example: {SS}. Simply substitute the keypresses below in place of each abbreviation. The keypress may consist of a single key, or of two keys pressed at the same time. But only press once for each occurrence of the abbreviation. The individual keys are inclosed in square brackets. Using the "{SS}" example given, this is simply a shifted space—press the [SHIFT] and [SPACE] keys at the same time, once. Also, the color and "reverse" keys always use the number keys in the row just above the alphabetical keys, not those of the keypad.

Abbreviations Table

{SS} = [SHIFT][SPACE]
{SL} = Blue = [CONTROL][7] (just a quirk)
{CD} = [CURSOR DOWN]
{CU} = [CURSOR UP]
{BR} = Brown = [COMMODORE][2]
{BL} = Black = [CONTROL][1]
{DL} = [DELETE]
{RV} = Reverse ON = [CONTROL][9]
{RO} = Reverse OFF = [CONTROL][0]
{HM} = [HOME]
{7} = Bell Tone = [CONTROL][G]
{ES} = [TAB] = Extended/Expanded Space
{GR} = Green = [CONTROL][6]
{BL} = Blue = [CONTROL][7]

The only other character you may have trouble with is the "check mark" toward the end of line 5. Use [SHIFT][Commerical AT], [SHIFT][@], to get it.

Program Functions/Lines

Now for a line-by-line explanation of what's happening in the program. Refer to Listing 1. Steps that are designated as "Good Practice" are included because you don't know what conditions may be present before the program starts to run. They are precautionary, and help insure that the expected results do indeed occur.

Line 5: simple reminder of filename, in a format that allows

DSAVE typed on top of 5 REM to work properly with a [RETURN]. Use this trick if you modify the program; just update the version designator also stored here (.3).

Line 10: select uppercase/lowercase character set = good practice.

Lines 20-160: title screen, with a pause for time to read.

Line 170: checks whether the 80-column screen is being used. If so, updates variable "w" (width), and sets Fast mode (my preference).

Line 180: for 80-column screen, calls Attribute Adjust subroutine at 750, and establishes full-screen active window = good practice.

Line 190: clear the screen and initialize all colors. Change to suit yourself.

Line 200: this line is just for show, to brighten up the screen display.

Line 210: printed initially as the 23rd screen line, this will be copied down to the new line 26, if your system can display it. Substitute your own creation here. Note the extra long, additional printing if the wider 80-column screen is in effect.

Lines 220-310: additional set-up lines/segments that will be copied down to new lines 27 and 28. Substitute yours here, too, if you wish.

Line 240: if you want to use this line, or one that uses a quote mark as part of the display, you must follow these instructions while typing in the line, or if you edit the line in any way, even by just hitting [RETURN] over it. Type line 240 as shown, hit [RETURN] to enter it into the program, then cursor back up into the line, putting the cursor on top of that single, central quote mark. Now insert two spaces (hit [SHIFT][INST/DEL] twice). Type a quote mark, press the [DELETE] key; hit [RETURN]. Don't ask; I don't have this one figured out completely myself. I just know it works—putting a quote mark in the screen display where I want it, after the DSAVE.

Line 320: just puts the cursor back into a known position.

Line 330: I've included this line just in case you don't like my black character color, and want to set it yourself to something else.

Line 340: necessary only if your system can't show more than 25 lines, or if you're using the 40-column screen. If so, change 24 to (24 - n), n = number of fixed lines you want. For example, changing the 24 to 21 will set 3 fixed lines at the bottom of your screen.

Line 350: if you had to change the above line, then eliminate the first REM of this line, and change the "21" to the same value you used in line 340. This POKE is the trick that will keep the lines fixed even after you hit the [HOME] key twice—which would normally disable the fixed lines, clearing any window.

Lines 360-390: set up the string variables that are used in the key definitions. The tab-over scheme in

line 390 is the one that jumps over a directory filename to put a delimiting colon after it. This eliminates the problem of a directory's PRG, SEQ,...getting involved in a disk access command.

Lines 400-470: these are the new function key definitions. Note the use of some capital letters! If you use my definitions, they must be typed in exactly as shown. Use the command abbreviations (with the caps); don't type the full command word out. Contrary to popular belief, there is a limit to how long an individual key definition can be. Maximum length: 128 characters. I found this out through experience. A new key definition longer than 128 characters results in the old definition being retained, but the length of the definition being made too long—a real mess! So tuck this one away in your personal database of pitfalls to avoid.

[F8] Function Key

All but the [F8] key definitions should become clear when you

translate and use them for awhile. [F8] is another bonus I've thrown in. Hit it, and you see the definition line print on screen, then...nothing. Now hit [P] for print, and the promised LLIST function begins. (LLIST = list the program in memory to your printer.) Hit any other key and you seem to simply get a "READY" prompt. Here's what's really going on, and why.

Quite a few BASIC programs redefine the function keys, but usually only [F1], [F3], [F5], and [F7]. The shifted function keys are often left alone. If [F8] has not been redefined, you can use it to re-capture the rest of the key definitions. After you run this program, change any of the key definitions you want—except [F8]. Then hit [F8], then any other key except [P]. Then type the direct mode command: KEY [RETURN]. You will see all my original key definitions appear.

The definition takes advantage of the WAIT command to get keyboard input. GET and GETKEY won't work

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ATARI

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is used to read the trakball and contains machine language routines that display the contents of this register and that converts the trakball movement into horizontal and vertical velocity components. Bit 4 is used to register the vertical rate of motion (the bit alternates between 1 and 0 at a rate dependent upon the speed at which the trakball is moving); Bit 3 specifies the direction of vertical movement (0 is up, 1 is down); Bit 2 registers the horizontal rate of motion (also an alternating bit); and Bit 1 gives the direction of horizontal movement (0 = left, 1 = right). Velocity is determined by sampling Bit 4 and Bit 2 over a short period (through a machine language routine) and summing up the changes in the bits for each direction component over the given period of time. Calculating acceleration, as you want to do, would be somewhat tricky. You would need to take two samples of the velocity over a given time (the velocity having been obtained by sampling the movement bits as described above). This would have to be done in machine language to assure a fast enough sampling rate. Angular position could be calculated directly through BASIC based on the horizontal and vertical components (which must have been previously calculated based on the velocities determined by the machine language routine). If any trakball owners have written such a routine or would like to write one, I would be happy to print it for Mr. Palhof and other trakball owners. Frankly, I don't know how popular the trakball controls are among Atari computer owners, but if there is enough interest expressed by readers, I may develop a couple of trakball routines and drivers for the column.

Regarding your second question, Antic would most likely have forwarded

any letters to the author. You might try Atari regarding the technical notes, although I'm sure availability has changed since January 1985. Perhaps some readers can help out.

Dear Jeff:

My user's group is interested in submitting some of the programs we wrote in the hopes that you can publish them in your column. Would you be interested in seeing our work? If so, how should we submit the programs? (i.e. do you require hardcopy in addition to the diskette?)

Barry Chase
Tacoma, Washington

I would certainly be interested in seeing your group's programs. This applies, of course, to all users' groups or individual program authors. Space limitations do not always permit the publication of lengthy programs, but I would consider publication of short and medium length programs that are useful to other readers. You can submit the programs on diskette (we'll generate the program listing from the diskette if needed along with a letter stating the programs are your own (or a modification of a public domain program). If your users' group sells a diskette with the programs, let me know and I will mention this fact for readers who dislike typing. Additionally, I'll award an 8-bit software product to the author whose program is selected for publication.

Reader Requests

I often receive letters from individuals who are looking for a particular program or for a particular piece of information. This month I have published several of these requests and ask any readers that can help to please write in. I will forward the information to the individual re-

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in function key definitions, since the definitions operate as direct-mode commands. But you can WAIT for keyboard input, then test it with IF/THEN/ELSE/..., and react accordingly. Pick this one apart and experiment with it. I would be very interested to hear what new applications you come up with.

Lines 490-500: these load one of my pet utilities. If you have it, keep 'em in. If not, substitute your own.

Lines 510-550: shows how to redefine the [RUN] key (= [SHIFT] [RUN/STOP]). You can now cursor to any directory filename, hit [RUN], and that file will load and execute automatically. Or redefine this key to any other purpose you want using the technique provided.

Lines 560-580: same type of redefine, except for the [HELP] key. You can redefine this one, too, to another task.

Lines 590-670: information about all of our additions and changes, printed to the screen.

Lines 680-690: allows a skip-over-perf set up on my Epson printer. Again, just one of my preferences.

Line 700: start up MetaBasic 128 (if you have it).

Line 710: Finished. I prefer not to include NEW in my programs.

Lines 720-800: subroutine to set >25 lines on the 80-column screen. You may leave these lines as-is even if you are only adding one or two extra lines,

instead of my three. Just keep the bottom-most fixed lines blank during your format set-up if your monitor can't show them.

Lines 810-830: set up the VDC for a Block-Copy. My choice to -Copy rather than to Block-Move was purely arbitrary. Change to -Move if you don't want to retain the source lines (23-25) displayed on your screen. Of course, I'll leave exactly how to do that for you to research.

Line 880: calculate the start address in high-byte/low-byte form of where to copy video memory to.

Line 890: store the results in the VDC registers.

Line 900: likewise calculate where to start to copy from.

Line 910: and store these results away.

Line 920: store how many bytes to copy—copy function commences immediately thereafter.

Lines 970-1010: do the same copy of attribute memory.

Lines 1030-1040: restore VDC to normal operation, and return to main program.

Lines 2000-3060: fun; see the comments below regarding fifty (50) lines on-screen, all at the same time.

50 Lines, or 640x400! Pixels

As a final exercise, consider this. Did you know that your 128 is indeed capable of displaying a full 50 lines at one time? Or that it can have an ultra-ultra-resolution display of 640 by 400 pixels? It most certainly can; your monitor becomes the limiting factor.

- 1) Atari 800 CPU; 48K RAM; 40/80 Col Board (Bit 3)
- 2) Two 810 type disk drives
- 3) Atari 850 interface box
- 4) 410 recorder
- 5) US Robotics Courier 1200 Modem
- 6) Gemini 10X printer

If there is anybody who knows of a program that will work with the 850 and a non-Atari modem, please let me know.

Robert Davis
Tampa, Florida

Dear Jeff:

Have you or your readers ever come across any information on ways to modify the 1200XL and 800XL audio, video and TV circuitry, so that the output resembles that of the 800? I have a 130XE (320K), 800XL (Rambo), 1200XL (Rambo), and an 800 (Axlon). The 130XE is almost as good as the 800 for video and TV, but the audio needs boosting. The 800XL also needs the audio boosted, and the video and TV have color smear, and lack contrast and brightness. It has no monitor jack chroma signal. The 1200XL is the worst of the lot. It has adequate audio output, but the video and TV contrast are boosted to the point of ghosting, the brightness is too low, and there is also no monitor jack chroma signal.

Michael Bernard Pook
Niagara Falls, Ontario

The remedy for the 800XL video smear has been discussed in a previous column, a copy of which I am sending you. Regarding the other audio and video changes you are interested in making, I do recall seeing an article in

Try this short program for a dramatic example. Type in:

```
10 rem :: 128 80-column 50 line
demo ::
20 wr = 52684:rem :: sys address of
vdc write routine ::
30 sys wr,128,0:rem:set register 0 to
128, compensate for interlaced
40 sys wr,64,4:rem:set register 4 to
64, allow the larger screen ::
50 sys wr,50,6:rem:set register 6 for
50 actual screen lines ::
60 sys wr,58,7:rem:set register 7 to
58, move screen up slightly ::
70 sys wr,3,8:rem:set vdc to inter-
laced sync + additional video ::
80 stop
110 rem :: return to normal 25 line
80-column screen ::
130 sys wr,126,0: rem :: reset vdc
registers to default values ::
140 sys wr,32,4
150 sys wr,25,6
160 sys wr,29,7
170 sys wr,252,8
```

Sample Run

Go into 80-column mode, type "RUN" and hit [RETURN]. When you are finished, just type "CONT" and hit [RETURN], again, to get back to your normal screen. Or type "GOTO 130," with the [RETURN], if you get totally lost.

You're right; the screen flickers, and the text is difficult to read. But that is (typically) a limitation of our monitors. Even the Amiga had problems with flicker. Try typing in some keyboard graphic characters, and see if you can pick out the individual pix-

a user's group newsletter quite some time ago on this very subject. If the author or user's group would send in another copy of the article, I would be grateful.

Dear Jett:

We're looking for a computer game similar to Milton Bradley's "Connect Four," that I believe you mentioned had been published in a user group newsletter. We would really appreciate it if someone could advise us how to get a copy of the program.

Bill Peet
Ocean, New Jersey

Best Newsletter Contest

Next month is the start of our monthly newsletter contest, where I select the best newsletters that have been submitted during the month. The addresses of the newsletters and all club information will be provided for readers interested in subscribing to the newsletter or joining the respective clubs. If your group puts out a well designed newsletter that makes use of assorted type sizes and graphics, and contains a good balance of news, reviews, projects and programs, send it to me at the address below. Important note: I have received several newsletters from groups very eager to be judged "best newsletter" that have submitted the best newsletters the group has ever published—some several years old! But we're looking for consistent quality as well as newsletter masterpieces, so as a rule, newsletters submitted for the contest must be recent. Newsletters dated more than two months behind the month of receipt cannot be considered.

els of the 8-high bit pattern of each character.

It's also true that the 128's screen editor is only designed to deal with 25 lines of information. Those pair of reverse "Commercial AT" characters are actually the contents of Attribute memory. You see them because those locations are now part of visible screen memory. The necessary attribute memory that would show them properly is now higher in memory, and it hasn't been initialized yet by the computer. Remember? The built-in screen editor doesn't count higher than 25, and neither does the attribute handler.

(Screen + Attribute) = Visible

O.K., I'll run that by one more time. Remember that screen memory only holds the character code that is to be displayed. A corresponding location in attribute memory gives the information about color, reverse, character set, and so on that actually lets you see that character on the screen. Attribute memory typically follows video memory, and is the same size. So, we have 2048 locations (bytes) for screen memory, and a following 2048 locations of attribute memory—all for 25 lines.

And now we've suddenly doubled the screen size—up to 50 lines. Screen memory must use 4056 bytes of memory, and attribute memory also needs an additional 4056. Previously, we had true sequential video memory, as shown in Figure 1(a). Now, with our short experimental 50-line program, we have overlapped memory, as shown in Figure 1(b). Luckily, when the 128 is turned on, it puts values in all this memory that result in visible characters. We haven't controlled what those characters are, or their attributes. They just happen to appear as the "Commercial AT" symbols on the monitor.

Results

The result of all this:

1. You can get 50 lines on your monitor.
2. You can achieve 640x400 resolution.
3. If you want 1 or 2, you must take complete responsibility for lines 26 through 50, as well as for graphics.

Commodore's operating system is only geared to automatically handle the first 25 lines, taking care of the rest is left completely to you, the programmer.

VDC Memory Usage Explore!

I hope this whets your appetite to explore the 128 in more detail. The following publications are very informative, and were instrumental in putting these routines into effect.

References

Mapping the Commodore 128, by Ottis R. Cowper; *Compute!* Publications, 1986.

The 8563 Video Display Controller, by David Stidolph; *The Transactor*, Volume 7, Issue 03; November, 1986.

Commodore 128 Internals, by Gerits, Schieb, & Thrun; Abacus Software/Data Becker GmbH, 1985.

Commodore Power/Play, Issue 2-3/86, pg. 58 (Function Key Definition ideas).

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questing it, and will publish any interesting or useful responses in a future column for the benefit of other interested readers.

Dear Jeff:

I am interested in obtaining a Lot-to-program. Has anybody written one? Is it in the public domain? If not, how can I obtain a copy?

John Ellington
Vandenberg AFB, California

Dear Jeff:

I was reading in the September issue and I too am interested in getting Atari 5200 cartridges to work on my 800XL. I recently bought some 5200 game ROMs. I took apart Qix and took out the ROM and put in the 5200 ROM. When I turned on the 800XL it went to the self-test menu as if there were no ROM in the cartridge. I tried putting it in both sides and upside down. Then I decided that since Qix is a 16K cartridge, I would try it in Star Raiders since it is only an 8K cartridge. To my disappointment, the results were the same with all the 5200 ROMs, in either cartridge. Is there any way I can get these ROMs to work? Has any of your readers had success in doing this?

Paul Strutz
Bismarck, North Dakota

Dear Jeff:

I am looking for a VT-100 emulator that will work with an 850 interface box with a Courier 1200 modem hooked to it. The system consists of the following:

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utility, make. For those of you that haven't had the pleasure of working with UNIX, make is a program that runs the C compiler for you.

C programs are often made up from header files, C source files and sometimes assembly language files. The C compiler itself is often composed of several passes: the pre-processor, the parser, code generator, assembler and linker.

Make reads a file that contains instructions on how to build a C program and then runs the files through the required passes of the compiler to produce your program.

While a lot of C compilers have used batch files to accomplish the same thing, make offers an important difference.

Often larger C programs are built up from several C source files. If you are editing and debugging one of the files, there is no reason to run all the other passes of the compiler, you only need to link in the object modules for these files.

Make looks at the time and date of the files that go into making up your C program and then only compiles the files that have changed since the last compile, or files that depend on a file that has changed.

If you edit a header file, make will recompile all the files that use that header, but if you only change one source file, only that file will be recompiled.

With simple programs, make is of marginal utility, but as the complexity of your projects increases, make becomes more and more useful. By the time you have 6 or more header files, and 10 or 12 source files, make starts really paying off.

The next section covers error message, and unlike most documentation Mark Williams give meaningful entries for the error messages. In the old days you would get error 14, and when you looked up error 14 you got something like illegal syntax.

As an example of the Mark Williams error message explanations let's look at "illegal use of a structure or union." This error message is generated by the cc0 pass of the compiler (the parser) and is an actual error message not just a compiler warning.

Quoting from the manual, "You may take the address of a struct, access one of its members, assign it to another structure, pass it as an argument, and return. All else is illegal."

That pins down the problem far more than the cryptic message provided by most compilers. Explicit error messages are even more important for people just learning C because there are so many ways to get yourself in trouble using C.

The error message section of the manual is over 19 pages long, and one of the finest (if not the finest) I have ever seen! If only this level of detail were provided by other compiler suppliers...

The next 592 pages of the manual are the Lexicon. This section alone makes the package worth buying. If all manuals were this good, everyone would be a programmer.

The Lexicon is arranged in alphabetical order. Each entry tells you what kind of item you're talking about, such as a general function, AES function, etc. It also tells you which library the function is in, the calling syntax and of course, the plain English description of what it does.

The thing that makes the Lexicon more useful than your average function listing is that it also contains entries for items like calling conventions, long, portability, and TOS. If you want to know how to change the stack size allocated for a program, try looking up stack in the Lexicon.

Following the Lexicon is the Permutated Listing of Lexicon Entries. This lists the Lexicon entries by types, and gives a few words description of the entry, and the page number the entry can be found on. It's a lot quicker to search these few pages than thumb through the Lexicon itself.

The manual wraps up with a fairly complete index, as you might expect. Summing up my impression of the manual, I wish all computer documentation were this good.

That brings us to the Compiler itself. On the plus side I am able to take programs written for UNIX and compile them under Mark Williams with no modifications. This is becoming an important point because the PC sports many compilers that allow this also.

It is quite possible now to write a program in C that will compile with no modifications under UNIX, DOS and TOS. I'm not talking about a trivial 200 line program, but real tools. This should go a long way to overcoming the "Games machine" image of the ST.

On the down side, the code generated by the Mark Williams C compiler isn't as tight as the code generated by the Alcyon compiler. It also takes some time to get used to the assembler included with the package as it uses non-standard conventions.

With C, you usually only code a few small routines in assembly and it isn't that hard to switch over. Mark Williams provides a utility to convert DRI assembly to Mark Williams assembly, but I have had problems with it.

On all of the assembly files I have tried to convert, the utility bombs out about 3/4 of the way through. Manual conversion of the remainder has always been easy enough.

The other utility I have had problems with is the print utility. The print utility seems to drop random characters.

Of course the libraries supplied offer full support of the BIOS, XBIOS, AES and VDI. The Lexicon has entries for each call of all of these.

I have been saving the best, or worst news for last. One of the reasons that I like Mark Williams is the shell. Running under the Mark Williams shell is a lot like running under UNIX. Many of the same utilities are there, and the options are the same as their UNIX counterparts.

For those of you unfamiliar with the term, a shell is a program that sits between the user and the operating system. In the old days we called these command processors. The desktop is a

visual shell, allowing to interact with the operating system services in an easy manner.

A shell offers things like the ability to redirect input or output (instead of a program's output going to the screen, you can send it to the serial port or to a disk file) and in addition can act as a programming language itself. Shells have variables, loop constructs and logical testing so you can create "super batch files" to ease the tedium of common day to day chores.

If you are used to UNIX, Mark Williams is the only way to go on the ST. If you want to learn what the fuss over UNIX is all about, Mark Williams will give you a feel for it. With the rise in the popularity of UNIX, Mark Williams may be a cheap way to get your feet wet.

The drawback is that UNIX (and the Mark Williams shell) is a very complex collection of programs and capabilities. It's not the easiest thing to learn to use, and it completely

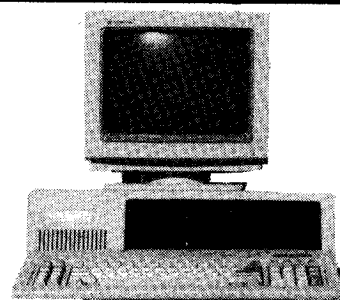
throws TOS, and the desktop out the window.

Overall I like the package, but the shell and UNIX like utilities may prove to be too much for many people that are just interested in learning a little about C. On the other hand, it's the next best thing to UNIX, and the only option for the ST at this time.

I really like the ability to compile stock UNIX programs, but if you're trying to squeeze the last ounce of performance out the ST, you'll want a compiler that produces tighter code.

At \$179, Mark Williams C is not what you would call an inexpensive program, but quality often costs. With the exception of a few minor bugs in some of the utility programs supplied the package seems very solid. If you're serious about C and the ST, Mark Williams may well be the way to go.

Mark Williams C \$179 may be obtained from: Mark Williams Company, 1430 Wrightwood Avenue, Chicago, Illinois 60614. ●



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Atari ST News continued from page 169

Speaking of getting into stores, after much hue and cry, the long awaited fully Hayse compatible 300/1200 baud Atari SX-212 modem (seen for under \$90) and the Mega computers are on some dealer shelves. Not Yet: the Laser Printer, which Atari might be holding back in order to iron out some agreement for Postscript software licensing, and the PC Clone, which is rumored to be released without the EGA emulation, leaving CGA and Mono graphics.

Compatibility is a big concern for Atari Mega owners. The bad news is that new ROMs in the new MEGAs make about 16% of the 800 or so tested commercial ST programs unrunnable on the new top-line flagship of the company. The good news is that a "translator," essentially the older ST operating system on a disk file, can make most of these operate on the machines.

Prices: The Mega systems will be just under \$2000 (that's two thousand!) for the 2-meg, and just over \$2000 for the 4-meg. If those prices seem too high, don't worry, most of us won't be able to find any way to buy one anyway, since Atari is planning to be hard line on "no mail order" for the Mega line, and soon, the 1040ST too. We heard this before too, but the marketing folks at Atari have convinced the Tramiels that cutthroat mail discounting is preventing a dealer organization from succeeding. This plan will get more \$\$\$ for the retail dealers, which of course means that they might actually want to sell them. I hope it works, but it is also going to be so very hard to qualify as a Mega/1040 dealer, that us small-townners may have to drive all day to buy an Atari. New at Atari is Walt Wilson, formerly of Apple, who will be in charge of building the dealer network that has been so desperately needed for so long.

Atari has made a big noise in the music industry with the Midi port on the ST. Since it is the only computer that offers such an item built in, plus has all that power and only that price, the ST has become the #1 computer of choice for musicians. Musicians? Germany's Tangerine Dream group (makers of New Age music for many years, as well as sound tracks for Thief, Firestarter, Risky Business, etc.) uses six 1040STs to control their dozen or so synthesizers and samplers. The computer is becoming so integral to modern music making, that many music stores now carry Computer Software, and yes, Atari ST computers! Atari was the first computer manufacturer to go to the National Association of Music Merchants show, and was swamped by hopeful vendors. Who needs to dig between toys to buy Atari computers anymore—just look between the guitars and the drums.

More Emulators Appear. You've been following the flack on Darek Mihocka's ST Transformer (800 emulator for the ST)? Of course you have. It is now being circulated in the public domain, and getting much better reviews now that the more complete version is being seen and tested. Expect more development, as interest

is just as high as we expected. Now, how about another 8-bit emulator? Steve Jones, of Pennsylvania, has shoved his own version of an 8-bit emulator into a cart for the ST! While sound and some graphics modes are not supported yet, Steve's version is estimated to run at 70% of the 8-bit speed, as opposed to 40-50% as in Darek's more complete Transformer. Like Darek's, the Jones version has printer and modem support, but even features Axlon-Emulation to use the extra memory of the ST as RAMdisks. Steve runs "Jonesware," and expects to market his cart like the Magic-Sac, where the user must supply his own ROM Chips to make the unit work. Price: around \$50. No word on Atari's view of this possible new entry into the emulation market. Jonesware, Box 7037, Mechanicsburg, PA 17055.

David Small of Data Pacific was showing his latest Magic-Sac and Disk Drive Adaptor at the Atarifests lately. He says that his latest software makes the ST more compatible with Macintosh Software than even the Mac II! Version 4.5 has automatic Crash Prevention, recovering from even Software Bugs before you can crash, hard drive support with separate Mac and ST partitions, and allows Epson-Printers and Apple LaserWriter support. The new drive adaptor plugs into the drive loop and controls all drives online so as to be able to read and write in Mac format. Very nice, as copy protected Mac software can now join the list of Sac-Compatible software. Projected price: \$225. Projected availability: any time now. Data has had problems with Bad Chips, stalling the expected October release. Small is smoking (as are the ruined circuit boards) but hopeful that not much more time will be lost. Data Pacific, (303) 733-8158.

Minor bugs are getting full and fast attention from PC:DITTO folks at Avant-Garde. The incredible IBM emulation software for the ST is known to run everything any clone can, but doesn't like some clone DOS's (Zenith, PC's Limited, Blue Chip, Hitachi). Formatting a virgin disk in IBM form also generates an error. And, the current version only supports color monitors. Patches and fixes are being distributed, with an update available any time now that should also give monochrome support. Avant-Garde, 381 Pablo Point Drive, Jacksonville, FL 32225; (904) 221-2904.

WordPerfect, the long awaited ST version of the top-ranked IBM and Mac word processor, should ship in October. Since it does any and everything, it is thought of as worth the hefty (by Atari standards) price of \$395. But students are eligible for an equally hefty discount, making the student cost only \$99! Write to "Educational Department, WordPerfect Corp, 288 West Center, Orem, Utah 84057" and ask for the student direct order form. Even when you get a form, you may have to write-in the Atari ST version as your choice on the order, since the new forms are not ready yet. I would list some features to convince you all of just how good

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Atari ST Outlook

After TOS, What?

by D. F. Scott

The ST is a machine made virtually of clay. In its inception, the never-released model 130ST was intended to be a grey Macintosh with a color monitor. The operating system was versatile—meaning it could be changed every few months merely by replacing the disk—and since Atari was still a respected name in the mass market, the buyer would be able to locate an ST in his nearest department store, or even toy store. If it didn't work within 90 days, the owner could send it back.

Two years later: The top-of-the-line ST has 32 times the internal storage capacity of the first prototype. The design is modular, and the internal bus is finally open. The operating system is fixed, verifiably, in all forms of the word. A dealer network is being formed outside the now Atari-owned Federated retail outlets; and ST dealer conditions, once finalized, should be rigid. The machines are sold by dealers on commission, with Atari sending the dealer its cut. Should the dealer not sell enough STs, then it really is cut.

To the mass-market observer, it may seem the Corporation has taken its own sweet time remaking the ST. To the person whose experience lay with larger computer corporations, two years is relatively the blink of an eye.

Yet in the development of this all-purpose 68000 toolbox, there is one important obstacle to be overcome: Engineers, statisticians, and analysts need an operating system that will not only communicate, but cooperate, with computers and devices in the outside world, regardless of their brands. TOS isn't it. Reason: Its structure is ST-specific. Although it can communicate with RS-232 or Centronics-based output devices, you can't exactly connect a multiscanning projector or a remote digital image sensor to the printer port. Besides, TOS cannot be part of a timesharing system, no matter what LAN system it's connected to, since it can't multi-task. It will always consider itself the host, and GEM will only pay attention to whatever single program it happens to be running.

So connecting the current ST to a host mainframe, like a System 38 or a VAX, is completely out of the question—which is a shame, since the next-least-expensive alternative 68000 terminal may cost five times as much. It would help if the ST could run UNIX. That's not technically feasible, because UNIX requires system hardware the ST doesn't have. In order for the system to continue its growth, engineers need the opportunity to configure hardware enhancements for the Mega ST's new bus expansion, making it a potential component of an interactive computing environment. This feat requires an entirely new ST operating system.

That is precisely what we are about to receive.

The Second ST Operating System

It is an operating environment unlike any the diehard Atari user/programmer is used to. In this edition, we'll explain some of its logistics. It's called IDRIS; and although it runs UNIX software and communicates with UNIX systems in such a way that mainframes can't tell the difference, IDRIS is not UNIX. It is instead an adaptation of the UNIX environment for, among others, 68000-based machines, as is Microsoft XENIX for the IBM PCs.

The operating system itself is a product of Whitesmiths Ltd. of Westford, Massachusetts; and is adapted for the ST by Computer Tools International of Seattle, Washington. Atari has signed an agreement making it a distributor of IDRIS for the ST, as well as future machines which may include its ABAQ Transputer.

Telford B. Sartell is Whitesmiths' vice president for Development. Here, he explains the history of his company and its primary product: "Whitesmiths was founded in 1978, primarily to make C-compilers available for non-UNIX systems. The first product was for the PDP-11. When the company was founded, it needed a development system; and the company's founder was Dr. P. J. Plauger, who worked at Bell Laboratories with the people who were inventing C and UNIX. He could only afford to buy a small PDP-11 with no memory management. He wanted to run UNIX, so he built a kernel that would run on that hardware and would execute UNIX version 6 programs unchanged. That was a complete, from-the-ground-up, building of the UNIX clone. That's the beginning of IDRIS.

Over the years, it was ported from the PDP-11 to 68000s, 8086s, and the VAX. Some of those were cohabitating systems—on a PC it runs under DOS, on a VAX, it runs under VMS. The place where IDRIS found its largest home was on 68000-based machines without memory management, like the Atari.

Both IDRIS and UNIX are multi-tasking systems—which means they have the capability to run several processes concurrently. The term "process" is almost synonymous with "program;" the difference is, a process can be interrupted or stopped temporarily, and changes can be made to the data that process was working with, by some other process in the queue.

The way we normally think about microcomputers, a program is run by the operating system's interpreter. Anything that interrupts a program is either a "memory-resident" routine or a system function; otherwise, it's either running or it's not. The data the program generates resides in memory reserved just for that program. The OS

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MSDOS For ST

continued from page 170

ing major slow, so slow that when I first tried the L.S. Larry game I thought it wasn't working because the graphic screens took so long to generated.

To try and quantify how bad this speed problem is I did two things. The first and simplest was to run the system information option of PC-TOOLS. A very good collection of utility programs from Central Point Software. This program reported that my pc-ditto'd ST was running a NEC V20 CPU, and that I was running at 15% of the speed of a genuine IBM PC.

I couldn't believe it only 15%, I mean I knew it was slow. But I didn't think it was that slow. So I wrote a simple little bench marking program in Turbo Pascal to test this out a little further. What this program does is three simple loops. The first writes a screen of text then clears it, this executes 50 times. The next computes the square root of 1 to 1000. The last writes a 1000 lines to a disk file. The time each of these loops take is reported at the end of the run. I ran this on both my clone which is a 4.77 Mhz machine with a 8088 CPU, and on the ST under pc-ditto. The results are in Table 1.

If you add the time for all three tests

the pc-ditto'd ST runs at 51% of the speed of a standard clone, and if what your doing isn't disk intensive the performance is much worse.

The question of is pc-ditto a good buy or not is difficult. Avant-Garde Systems did an amazing thing. PC emulation is not a trivial problem. And the program does everything they claim it will. You can tell the people at Avant-Garde are care about their customers by reading the README.-1ST file on the program disk. There is a lot of really good useable information there.

If you got to have IBM compatibility for your ST pc-ditto is the only way to go. You might think the lack of

speed is acceptable, a lot depends on how much you intend to use DOS programs on your ST. If you are just want to experiment with MSDOS, or have a single project you need to get through. Like a class that requires the use of a MSDOS program. Sure go ahead and get pc-ditto. If you however want to use pc-ditto to run say Lotus or Word Perfect on a regular basis, do yourself a favor, and either buy a ST version of the program you need, or buy a compatible to run it on. For me unless they make vast improvements in the speed of the product pc-ditto will remain in the interesting but useless category. I'm basing my comments on version 2.0 of pc-ditto.

BENCHMARK RESULTS

TEST	PC	pc-ditto	%
Screen	74.92 sec.	140.10 sec.	53.5%
Square Root	8.90 sec.	85.85 sec.	10.4%
Disk Write	55.75 sec.	47.78 sec.	124.5%

Table 1.

program Benchmark(input,output); (Bill Krieger Benchmarks 1st ver. 10/30/87)

```
Var
  HrSt, HrEnd   : Integer;   ( Start and Ending Time Var. )
  MinSt, MinEnd : Integer;
  SecSt, SecEnd : Integer;
  FracSt, FracEnd : Integer;
```

```
procedure Get_Time(var Hour,Min,Sec,Frac : Integer);
( This procedure is from page 208 of ref. manual )
Type
  RegPack = record
    AX,BX,CX,DX,BP,SI,DI,DS,ES,Flags : Integer;
```

```
Var
  Regs : RegPack;
```

```
begin
```

```
  With Regs do
  begin
```

```
    AX := $2c00;
    MaDos(regs);
    Hour := hi(CX);
    Min := lo(CX);
    Sec := hi(DX);
    Frac := lo(DX);
  end;
```

```
end; ( GetTime )
```

```
procedure C_Screen;
( this is needed because PC-Ditto doesn't handle the built in
  clear screen function correctly )
```

```
var
  i : integer;
begin ( manual clear screen )
```

```
  for i := 1 to 25 do
    Writeln(' ');
  end; ( clear screen )
```

```
procedure WaitKey;
```

```
Var
  x : char;
```

```
begin
```

```
  writeln('Hit Return to continue');
  readln(x);
```

```
end; ( WaitKey )
```

```
procedure ScreenTest;
```

```
Var
  i,j : Integer; ( loop counters )
```

```
begin
```

```
  for i := 50 downto 0 do
  begin
    C_Screen; ( clear screen )
    for j := 1 to 24 do
    begin
      GotoXY(j,j);
      Writeln('Screen IO test ...');
    end; ( j loop )
  end; ( i loop )
```

```
end; ( ScreenTest )
```

```
procedure Do_Sqrt;
( compute squares of 1-1000 )
var
  x,temp : real;
  y : integer;
begin
  x := 1;
  Writeln(' Square Root Test 1st 1000 squares ');
  for y := 1 to 1000 do
  begin
    temp := Sqrt(x);
    x := x + 1;
  end; ( y loop )
end; ( do_sqrt )
```

```
procedure File_out;
( write a 1000 line file to disk )
var
  testfil : text;
  i : integer;
begin
  assign( testfil,'test.Fil');
  rewrite(testfil);
  Writeln('File output: test writing 1000 lines ');
  for i := 1 to 1000 do
    Writeln(testfil,'This is a line of output to test disk ');
  close(testfil);
end; ( File_IO )
```

```
procedure Elapsed_time;
( the parameters for this procedure are global it's not
  the right way to do this but I got lazy they are HrSt, MinSt,
  SecSt, FracSt, HrEnd, MinEnd, SecEnd, and FracEnd )
```

```
var
  H,M,S,F : Integer;
```

```
begin
```

```
  H := HrEnd - HrSt;
  M := MinEnd - MinSt;
  S := SecEnd - SecSt;
  F := FracEnd - FracSt;
  if ( M < 0 ) then
  begin
    H := H-1;
    M := M + 60;
  end; ( if )
  if ( S < 0 ) then
  begin
    M := M-1;
    S := S + 60;
  end; ( if )
  if ( F < 0 ) then
  begin
    S := S-1;
    F := F + 100;
  end; ( if )
```

```
  Writeln('The elapsed time is ',H:2,' hours ',M:2,' Min. ',S:2,'.',F:2,
    ' seconds')
```

```
  waitkey;
End; ( Elapsed_time )
```

```
Begin ( main )
```

```
  Writeln(' Q&D benchmarks ');
  Writeln(' ');
  waitkey;
```

```
  Writeln(' Starting Screen I-O test ');
  C_Screen;
  Get_Time(HrSt,MinSt,SecSt,FracSt);
  ScreenTest;
  Get_Time(HrEnd,MinEnd,SecEnd,FracEnd);
  Elapsed_time;
  ( end Screen test )
```

```
  Writeln(' Starting Square Root test ');
  C_Screen;
  Get_Time(HrSt,MinSt,SecSt,FracSt);
  Do_Sqrt;
  Get_Time(HrEnd,MinEnd,SecEnd,FracEnd);
  Elapsed_time;
  ( end Square Root test )
```

```
  Writeln(' Starting File output test ');
  C_Screen;
  Get_Time(HrSt,MinSt,SecSt,FracSt);
  File_out;
  Get_Time(HrEnd,MinEnd,SecEnd,FracEnd);
  Elapsed_time;
  ( end file output test )
```

```
end. ( main )
```


IDRIS: Multi-Tasking Software For ST And Mega Lines

Atari Corporation has announced that IDRIS, a Unix-like operating system and six software programs that run under it, have been ported to the Atari ST and Mega computers. The new programs are: CrystalWriter Plus and Crystal Document Management System from Syntactics; Word Era from Tigera; Fusion Network Software from Network Research Corporation; and Lex P*D*Q and LEX-ET from Trajectory Software.

IDRIS gives the ST and Mega computers multi-user, multi-tasking capabilities—making the Atari computers the lowest-priced business and scientific workstations available today.

"Atari is committed to offering ST and Mega computer users advanced business, desktop publishing, scientific and engineering solutions," said Sam Tramiel, president of Atari. "As part of that commitment, we are forming strategic alliances with third-party software and hardware companies that can help us offer our users solid solutions."

"Porting IDRIS to the ST and Mega computer lines is a significant development for us," he added. "Atari will use IDRIS as the foundation on which we can build a library of software solutions to complement the growing number of titles available under TOS, the native operating system of the ST and Mega."

Version 3.0 of the IDRIS operating system was developed by Whitesmiths, Ltd. of Concord, Mass. and ported to the ST and Mega by Computer Tools International of Federal Way, Wash. Computer Tools said it will sell the operating system to Atari computer users for \$800.

IDRIS Features

IDRIS is a mature, UNIX-like operating system. It is fast, compact and compatible with the 1984/user/group standard for UNIX-like systems. IDRIS has a rich set of utilities for file and text manipulation and a large array of interprocess communication (IPC) facilities, including shared memory, locks and messages.

The operating system has two principal components, an executive and utilities. The disk based executive provides for multi-using and multi-tasking; IPC facilities; and device drivers for disk drive (Atari and Supra), printer, modem and MIDI ports.

IDRIS' development utilities include Whitesmith's C and Pascal compilers and function libraries, archive and librarian utilities and a debugger. The Ctext and documentation preparation utilities include a text formatter or typesetter, output device filters, user-definable filters and macro capability.

CrystalWrite and Crystal Document Management System

Syntactics' CrystalWriter Plus is a multi-user, object-oriented word processing program that offers a number of advanced features. As an object-

oriented word processor, it "understands" the components of documents, such as headers and footers, as well as different types of documents such as letters, memos and reports. It provides a library of model documents for frequently used formats. Additional models can easily be created. Its word processing features include automatic

formatting, WYSIWYG display, on-line help, a spelling corrector and integrated mail merge. A library of model documents can be used to create predefined formats.

Crystal Document Management System combines the document preparation elements of traditional word processing, office automation

and desktop publishing software to offer a single solution for the integration and coordination of high-volume, high-quality documentation.

Crystal, designed for workgroup activity, integrates advanced word processing and format database

continued on page 312

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Atari ST News continued from page 306

WordPerfect is supposed to be, but don't have the dozen pages to spare.

Have every program ever written (sorta): As Atari clubs have matured, they have amassed huge stocks of PD library software. At least one, C.H.A.O.S. of Lansing, Michigan, has gone a step beyond the "trades" that many clubs have done for years now. C.H.A.O.S. rents their entire library to any individual or club, a month for \$65, your choice of the 400-plus disk

side 8-bit library or 100-plus disk ST library. \$100 rents both. The rental includes extra copies of their remarkable 40+ page disk catalog, suitable for reworking for any club. This library differs from most club libraries in that it is 100% categorized. Chief club librarian John Baker says he stopped doing mass trades a while back "because we've seen 98% of everything already, and we threw out all the junky stuff. We probably ditched as much as we saved. We get nothing but raves from the people that rented so far." The income from the rentals goes

to support the club's investment in hardware to maintain the library and defray expenses in keeping current using PC Pursuit, GENie, and limited list trades. Contact C.H.A.O.S., P.O. Box 16132, Lansing, MI 48901, or the C.H.A.O.S. BBS, 517-371-1106.

On the games front: Mindscape will publish "home computer" versions of Atari Arcade games such as Paperboy, Gauntlet, Road Runner, and others.

It is important to remember that Atari Arcade games and Atari Corp are not really related—common criticism of Atari for not having an

Atari computer version of Atari Marble Madness while a Commodore version has been out for a year now overlooks this fact.

You read about the hot upcoming Star Trek game for the St in my column a few months back—well, it may not be forthcoming after all. Says Steve Dunphey of the Rhode Island Ace club, Simon and Shuster game division folks are incensed that beta copies got out and circulated in that cesspool of pirates called BBS's... so

continued on page 313

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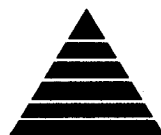
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IDRIS

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capabilities to automate and standardize document formatting. Automatic typesetting is fully integrated to generate high-quality documents.

LEX P*D*Q and LEXET

Trajectory Software's LEX P*D*Q is a powerful yet easy to use word processor program that has been ported to the ST and Mega from DEC and VAX systems. It features WYSIWYG display; the ability to store and recall commonly used phrases; an on-line help facility; integrated data and text processing for merge mailings and reports; standard formats for mailing lists; a 120,000 word dictionary; automatic and manual hyphenation; automatic headers and footers; automatic page and paragraph numbering; an on-line 4 function programmable calculator; and extensive function key support.

LEXET is a desktop publishing system that is designed to provide high-quality laser printer output for documents prepared with LEX P*D*Q. It can also be used as a stand-alone electronic typesetting system.

Word Era

Tigera's Word Era, a Wang compatible document management system for multi-user systems, lets users efficiently create, edit and print all kinds of documents. Its features include voice annotation and recognition; built-in windows to display different documents or different parts of the same document; footnoting; table of contents and index generators; spelling dictionary; hyphenation and pagination; forms processing and mail merge; and glossaries that can be used to automate word processing tasks.

Fusion Network Software

Fusion Network Software from Network Research Corporation is a comprehensive networking package designed to offer interprocess communication file transfer (FTP) and virtual terminal (TELNET) functions to a wide range of processor families, operating systems and network hardware supported by Fusion. These include all Digital VAX computers, PC ATs running MSDOS, and systems that use Xenix and VAX/VMS. It meets the widely adopted DDN/ DARPA standards for the TCP/IP (Transmission Control Protocol/Internet Protocol).

For more information contact: Atari Corp., 1196 Borregas Ave., Sunnyvale, CA 94086, (408)745-2000. ●

Easel ST

by D.F. Scott

A Lesson in Compu-sociology

Until the advent of the graphic operating system, nearly every factor relevant to the appearance of a microcomputer was considered in its design except for the general appearance of its display. Now, graphic overlays such as Microsoft Windows are introducing to millions of PC monitors such new and interesting items as shapes and color—items which have become commonplace to those of us in the ST realm.

I have yet to meet the person who preferred the "hospital green" of the color-model ST's default GEM background. He wouldn't decorate his office in that color; why should he decorate his Desktop in the same fashion? ST-users have become capable of modifying their operating screens to suit their personalities, to the point where their Control Panel configurations match their wardrobes.

Now there's a utility which allows the well-dressed ST operator to cover her Desktop with her favorite work of art created with NeoChrome or DEGAS, no matter what resolution of monitor she's using. She can post a picture she's drawn, one she's downloaded from a telecom network, or a digitized photo; and it will act like a poster which the GEM Desktop windows seem to float above.

Easel/ST is the very first product

from independent producer Bob Breum (pronounced "brim") and his new venture, Computer Fenestrations. It doesn't look like a first-time production, though. Its package, though small, is professionally designed and eye-catching, with a front panel that folds out into an instruction pamphlet written in an often forgotten dialect called legible English.

In terms of bulk content, the

Easel/ST disk doesn't contain much. The main program itself, contained in an AUTO folder, is under 6K in length; the remainder of the disk contains three DEGAS sample pictures. However short, Easel is extremely well thought-out, and appears to be a solid block of code. Absolutely no erratic behavior has been spotted with the operating system or other programs as a result of Easel/ST.

The reason: The way GEM works, the Desktop background is set up before any windows, icons, or menu bars are laid on top. So GEM generally sees the background as a green rectangle. Once a window or other object overlaps another, the contents of whatever was overlapped is retained in memory, and instantly restored to

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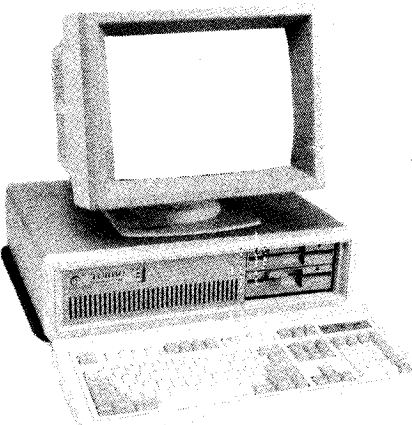
Atari ST News continued from page 312

much so that they have threatened to pull the game entirely. Steve saw a copy and wrote about it, all very positive and eagerly awaiting the commercial release so he could have a copy, and his article was widely reprinted. Next, he was on the hot seat for "participating" in the piracy. Hey, he saw it and tried his best to help promote the company and the upcoming product. Lets hope that 1) the thing actually gets released and is as good as it looks, and 2) that pirates don't kill the marketplace. I commend Steve for not keeping nor passing a hot copy, and thank him for his consistent help in Atari news gathering.

Piracy of commercial programs is such a problem in the "low end" computers (Atari, Commodore) that many software companies just give up. Another move is to get tough. Michtron, one of the leading ST program marketers, has offered a bounty for "pirate BBS's," call-in telecommunication services that offer illegal copies of commercial programs for modem users. Turn in a Bulletin Board System number that can be verified to have Michtron programs on it, and Michtron will give you \$200, or \$400 of Michtron software. Turn in three numbers, and Michtron will give you a hard drive. It sounds a bit like Vigilante justice, but what else can a company do? Michtron, 576 S. Telegraph, Pontiac, MI 48053; (313) 334-5700.

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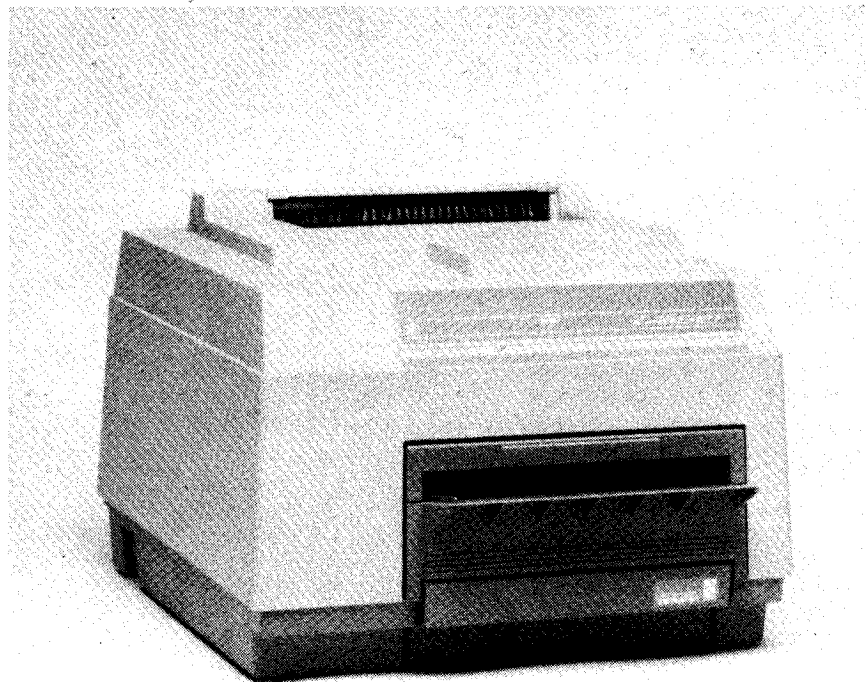
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Atari's New Desktop Publishing System



New Atari Laser Printer

Atari Corporation executives are certain that their advanced desktop publishing system will give the company a bigger share of the business market.

The low-cost, high-performance

system includes the new Mega 2 or Mega 4 personal computer operating with Atari's new laser printer.

Atari will sell the complete system, including the Mega, disk drive, monochrome monitor and laser

printer for approximately \$4,000—depending on the Mega model and monitor chosen.

The Mega's two or four megabytes of directly accessible RAM—depending on the model—can handle the most complex word processing, graphics and desktop publishing tasks.

The Mega is compatible with more than 1,000 software titles available for Atari's ST line of computers, including WordPerfect and Microsoft Write, two of the most popular word processing programs on the market; Publishing Partner, Fleet Street Publisher and Deskset from G.O. Graphics.

In addition to ST titles, emulators allow the Mega to run MSDOS, Macintosh, and CP/M software.

The Mega's BLITTER chip produces faster graphics on the monitor as well as in graphics applications. Some graphics applications will run up to 10 times faster. And the BLITTER, in combination with the system's large memory, give the Mega powerful desktop presentation capabilities, including animated graphics.

Atari's new laser printer, the SLM804, prints eight pages per minute at a resolution of 300 dots per inch (DPI). It has a much faster throughput and more flexibility than other laser printers due to a radical new design in its electronics.

Unlike other laser printers, which have a separate processor and memory to handle print instructions, Atari's laser printer relies on the Mega's memory and processor for the execution of print instructions.

Any image on the screen can be sent directly to the printer at 10 megabits per second through the DMA channel without requiring another set of print instructions. (Most laser printers have to translate screen instructions to page format instructions.)

In addition to being faster, the system is also much more flexible and less costly to operate because fonts and print instructions are software-controlled instead of being hard wired into the printer. Additional fonts can be added through software, obviating the need for costly font cartridges.

Paper can be fed to the SLM804 laser printer either manually, or automatically through its 250 sheet paper tray. Its toner cartridge can be used for approximately 3,000 copies and the drum is good for 10,000 copies.

The laser printer will be available at authorized Atari business centers at a suggested list price of \$1,999.95.

The Mega features a monochrome as well as a color monitor. The SM124, a 12 inch, high-resolution mono-

continued on page 318

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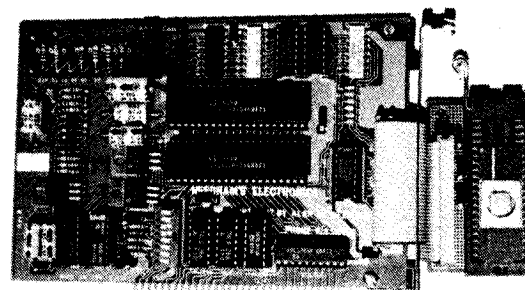
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Tigera Unix Software On Atari Mega

Tigera Corporation and Atari Corporation have jointly announced a strategic alliance in which Tigera will market a line of Unix office automation software solutions on the Atari Mega Series under the the IDRIS operating system. Tigera stated that Word Era, its feature-rich, high performance word processing package, will be available for single and multi-user Atari systems beginning the first quarter of 1988.

Word Era offers all of the features

of the leading word processing software and many more, including glossaries, math, document assembly, footnotes, multi-language dictionaries, support of the windows environment and both voice recognition and voice annotation. Word Era supports these features with easy access to every option for the sophisticated or casual user. Word Era has a Wang-compatible interface and document conversion capabilities.

Tigera offers both Unix and DOS versions of Word Era with complete feature, function and file compatibility, making Word Era a clear choice as a corporate standard. A wide variety of end-user and train-the-trainer courses are offered from novice to advanced levels. In addition, the Tigera support line offers fast and courteous service to our customers.

Amy Wohl, president of Wohl Associates, a leading office automation

consulting firm in Bala Cynwyd, Penn., said: "Tigera's Word Era product, with its windowed environment and its ability to support voice recognition and annotation give it a window into the future. Such features are sure to appeal to users looking for sizzle and product differentiation."

For more information contact: Tigera Corporation, 350 Bridge Parkway, Redwood City, CA 94065, (415)594-9981.

Easel ST

continued from page 313

its former position when the overlapping object is moved or removed. So whether that green rectangle is intact on the Desktop or in small segments scattered throughout memory, it does exist in toto at all times.

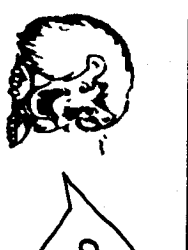
What Easel/ST does is replace that rectangle with a nice picture loaded in from disk. It does that job and then terminates itself; it's "outta there." GEM then goes about its business and maintains the custom picture just as if it were that ugly green rectangle, not knowing the difference.

Easel also sets the system colors at boot-time; so if you don't mind having a key click (I do) the user may delete the CONTROL.ACC from his boot disk, and free not only 16K of RAM but two accessory slots. That 16K is subsequently swallowed by the background picture—16K for low-res, 32K for medium- or high-res. By replacing the Control Panel, Easel absorbs a lesser chunk of extra memory than it would were it an ACCESSORY—which is loaded into memory after AUTO folder programs have terminated. This is an excellent example of strategic program production. Independent producers will be well-advised to keep their eyes on Bob Breum of Lake Monroe, Florida.

Psychologist Carl Jung helped to introduce the concept of archetypal images, or the basic visual constructs we react most strongly to, perhaps because of some underlying visual stimuli within those images which have influenced us previously or continue to influence us. Looking at my current Easel/ST-influenced Desktop, of all the artistic drawings I could've used as my background, I chose a Mercator-projection world map produced with Antic's Maps and Legends. I look at that, then I look at my oil painting of the Earth above one of my many desks, and then at the big Rand McNally Mercator map above my drawing board, and I realize how much I'm visually stimulated by the shape of the continents.

When we try to define an absolute purpose for Easel, it's obvious that its true usefulness is psychological, as a visual motivator. With my little clock running in the corner, my Desktop looks like a television news set; all Computer Fenestrations needs to make now is an accessory which generates a teletype-like noise, and I'd feel right at home.

That's the news; I'm D.F. Scott. Good night.



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Atari Mega 4

Atari's New continued from page 316

chrome monitor, shows variable font sizes and features a resolution of 640x400 pixels. The SC1224 RGB 12 inch color monitor has a resolution of 640x400 pixels with four colors and 320x200 with 16 colors. The Mega's exclusive BLiTTTER and Shifter custom chip, provides vivid, jitter-free images and fast scrolling.

The Mega 2 with a monochrome monitor is available at authorized Atari business computer centers at a suggested price of \$1,699.95. The Mega 2 with a color monitor is available at a suggested retail price of \$1,899.95.

The Mega 4 with a monochrome monitor is available at a suggested price of \$2,399.95, and the Mega 4 with a color monitor is available at \$2,599.95.

Atari Corp. is a leading, vertically integrated manufacturer and marketer of personal computers and video games. The company offers the 16/32 bit ST and Mega personal computers; the 8 bit XE lines of personal computers; the Atari PC line; the 2600, 7800 and XE video game systems; a broad line of peripherals, and computer and video game software.

For more information contact: Atari Corporation, 1196 Borregas Avenue, Sunnyvale, CA 94086, (408)745-2000.

Atari Abaq: 32 Bit, Transputer-Based Workstation

Atari Corporation has demonstrated a prototype of the Abaq, a 32 bit transputer that gives its Atari ST and Mega computers greater power than most dedicated workstations, at a fraction of the cost. When attached to a transputer, the ST or Mega acts as the input/output device for the system.

"The Abaq, which is the root word for abacus, is a micro version of a super computer," said Atari president, Sam Tramiel. "It is an extraordinarily powerful numbers cruncher that can also create graphics of almost photographic quality." A large, high-resolution monitor is under development for the transputer, he added.

The Abaq is faster and more powerful than conventional microcomputers because its high-performance microprocessor uses parallel processor chips and RISC (reduced instruction set computer) architecture.

RISC reduces the complexity of the chip, simplifies load and store instructions and makes them run faster. Load and store instructions are the majority of instructions used by a computer. Complex operations are performed through sequences of simpler operations. By contrast, conventional microprocessors require a large and complete set of instructions to operate.

The Abaq also overcomes the inherent speed limitations of a micro-computer because it uses parallel processor chips—which allow it to per-

form a number of operations simultaneously by spreading tasks among different processors. By contrast, conventional microcomputer chips can only process information in a linear fashion.

Because a transputer can communicate and process instructions and data at the same time, they can be connected in a daisy-chain to boost its speed and power. "It wouldn't cost that much to get up to 100 MIPS (million instructions per second)," said Tramiel. Transputers can be linked together through a built-in, high-speed serial port to form a multi-processor array or to form a local area network (LAN).

The Abaq uses the Inmos T-800—a high-performance 32 bit microprocessor capable of operating at 10 to 12 MIPS (million instructions per second)—roughly 10 times faster than an IBM AT. Calculations are performed at 1.5 megaflops (floating operations per second).

Abaq has four megabytes of RAM (random access memory) for the system plus one megabyte of RAM for the display. The basic system can be expanded by adding up to three cards, each of which will have four T-800 processors. The system can be expanded even further by daisy-chaining them together.

continued on page 319

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Network Research Corporation Supports Atari Mega

Network Research Corporation has announced that it has signed an agreement with Atari Corporation whereby Atari will be distributing Fusion Network Software with the new Atari Mega workstation to Atari customers requiring network capabilities. Fusion will operate on the Mega under the Unix-like operating system, Idris, which is manufactured by Whitesmith Corporation.

"This agreement makes Atari a viable participant in the professional workstation market," stated James Hunter, NRC president, "Atari will now be able to offer advanced LAN communications capability, compatible with systems from over 300 vendors supporting the TCP/IP protocols, like DEC VAXs, and IBM PCs."

Fusion Network Software will give the Atari Mega a complete set of TCP/IP protocols and applications which have been tested for compliance with the DDN/DARPA Internet Protocol specifications. This means, with Fusion, that the Mega will be able to perform File Transfer (FTP) and Virtual Terminal (TELNET) functions between systems already supported by

Fusion such as VAX systems running VMS and PC systems under MSDOS or Xenix, as well as many other vendors' TCP/IP implementations.

"Atari recognizes the importance of TCP/IP for multi-vendor communications," said Sig Hartmann, executive vice president of Atari. "We chose Network Research's TCP/IP implementation to ensure complete and standard

network communications support for our customers," he added.

Network Research is also providing Atari with its Network Management Software and Program Development Libraries. NRC's Network Management is a set of software utilities for testing network nodes, displaying statistics concerning packet transmission and reception, and monitoring

traffic on the network. The software allows users to capture traces of up to 500 packets with the ability to save traces to files for later recall.

The Program Development System libraries (PDS) are a set of 50 library functions modeled after the 4.2BSD IPC library calls. These can be used to

continued on page 320

Atari Abaq continued from page 318

It is capable of four graphics modes: 1280x960 in 16 colors or monochrome; 1024x768 in 256 colors; 640x480 in 256 colors with 2 screens; and 512x480 in 16 million colors plus overlay.

The Abaq will run under Helios, a Unix-like operating system that is being developed by Perihelion Software of the United Kingdom. A third party developer is already working on an MSDOS emulator that will run under Helios, according to Atari. Because of the Abaq's speed, MSDOS programs will run faster than they would on an AT or AT compatible.

Application programs can run using three programming philosophies. The first of these is the traditional model. Programs can be ported from other operating environments, such as MSDOS or Unix, with little or no change to run on Helios as a single process.

Other programs can run in several sections, all of which may be run as different processes connected by pipes. The Helios operating system encourages the use of many small programs which work together to create a final product.

On a conventional workstation, different processes are timesliced onto a single processor. In the Helios system, these different processes actually run at the same time. This "per process" parallelism is easily introduced since many programs are already in this form. For example, consider a word processor with background spooling and spelling checking, and background tasks such as message systems and archiving.

For more information contact: Atari Corp., 1196 Borregas Ave., Sunnyvale, CA 94088, (408)745-2000. ●

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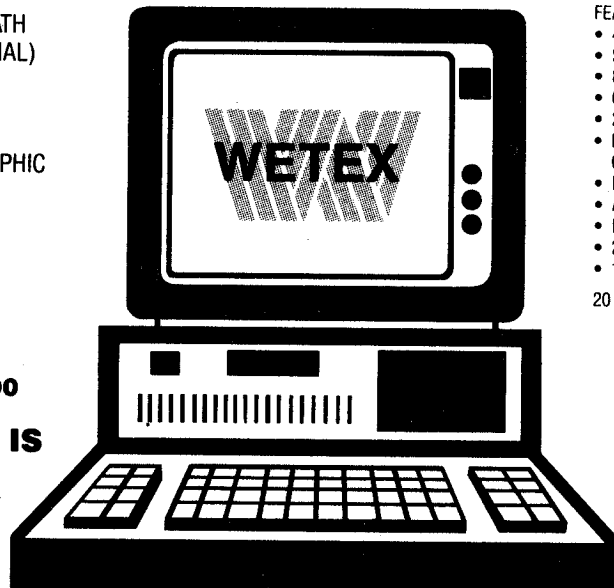
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WordPerfect 4.1 continued from page 170

Much of what WordPerfect can do has already been mentioned in a previous article dealing with the Amiga implementation (Dec 1987). Therefore rather than covering the same ground, it might be best to describe some of the things to watch out for. First, check to see what version is current versus what you have. If you can duplicate a problem you are having and do not have the current

version, WordPerfect will ship you the current release update free of charge: if you want the latest version just to "have it" and you aren't reporting a bug there is a nominal fee. Feedback from current owners has been very positive on the responsiveness of WordPerfect personnel, and there is a very active bunch of WordPerfect users on GENIE who are using WordPerfect.

Defining your printer can be very frustrating, especially if you have a printer which isn't listed among The

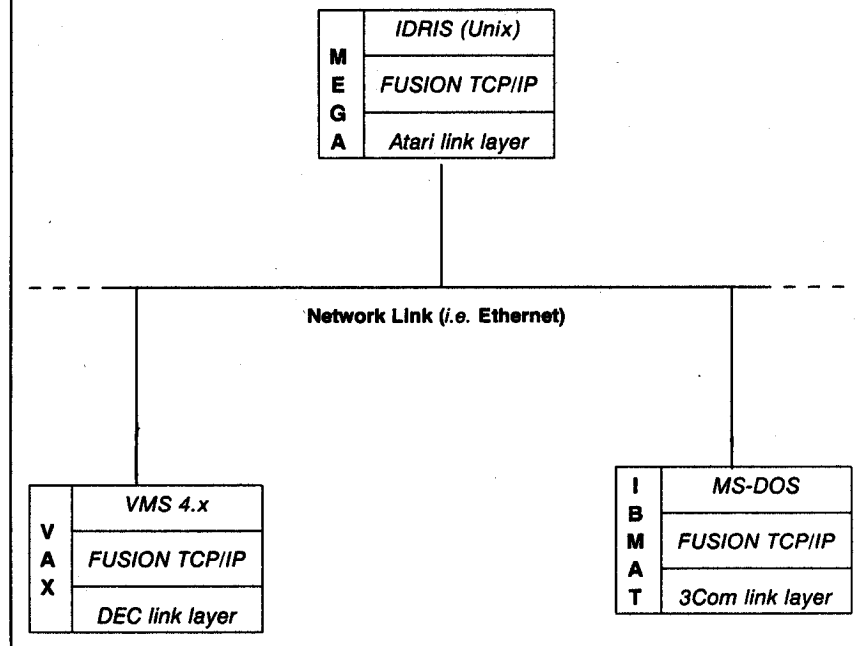
250-plus printers WordPerfect currently supports. Fortunately WordPerfect includes a Printer Definition Manual and a printer test file that you can use to add or change a printer definition. This utility also is used to define printer fonts, and this threw me off until I printed the test file and discovered that, among other things, the "fonts" were coded up to throw the printer into Near Letter Quality (NLQ) mode versus draft mode: you are likely to encounter this when defining Epson-like printers. Also, the fonts

define the character width if your printer is capable of proportional spacing. Another "undocumented" manual on the disk is the Speller Utility disk, which can be used to make changes to the master dictionary, and perform other useful functions.

In terms of performance, WordPerfect operation depends on whom you talk to. Overall response is that WordPerfect is a winner, but there are some people out there that have compared the ST version against the

continued on page 321

Sample Network with Atari Mega and FUSION TCP/IP



Network Research continued from page 319

create embedded network applications which are independent of operating system of processor selected. This way users can create one application and then link it to run on all of their different systems.

Standard user utilities and features under Fusion Network Software included:

- FTP**—File Transfer program using TCP (Transmission Control Protocol)
- TELNET**—Virtual terminal utility allowing remote "login" from host to host.
- SMTP**—(Simple Mail Transfer Protocol) Send mail from host to host.
- SERVER**—Background process which accepts connections from remote hosts and executes desired service requests.
- IP**(Internet Protocol)—Options in-

clude Security, Precedence, Routing, and Timestamping.

•**ICMP**(Internet Control Message Protocol)—Full implementation including Source Quench for gateway congestion.

•**UDP**(User Datagram Protocol)—Full accessibility through programming libraries.

Fusion Network Software from NRC provides connectivity in multi-vendor environments. Fusion runs on a variety of processors including the 80286, 80386, M68000, and all Digital VAX computers, and under many operating systems including MSDOS, Xenix, and VAX/VMS. All NRC products conform to networking industry standards and currently have support for TCP/IP and XNS protocols, NetBIOS, NFS, and DDN X.25.

For more information contact: Network Research Corporation, 2380 N. Rose Ave., Oxnard, CA 93030, (805)485-2700, Telex 297579 NRCO UR, FAX 805-485-8204.

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WordPerfect 4.1 continued from page 170

Amiga and IBM versions and have complained about how WordPerfect dragged. They say that the 10/1/87 version should have never been released especially when scrolling the screen. Other complaints have been sluggish mouse response and flat-out program bombing. I have had the first release die on me; but its been very rare. I did discover a bug which has since been fixed: if you have auto-backup turned ON and had an open dialog box, when the backup kicked in it would trash the contents of the dialog box. WordPerfect is aware of the many reports that have come in, and has taken action on a number of

them. In a number of cases they had to talk with Atari in order to resolve a problem (i.e.: they had to work around a number of OS miscues.) As far as the screen dragging, yes, it does, and I have not seen WordPerfect on a Mega ST to see if the blitter helps alleviate the problem.

I think the real big hangup with a lot of folks is its price tag. This is indeed understandable, but WordPerfect is almost an institution in its own right, and its Customer Support has nothing but praise being heaped upon it by many of its users (WATS lines ain't cheap, for starts-and I'd be willing to wager a fair amount of the dollars spent goes to customer support—something very rare in this industry). Whether or not you feel the

price is reasonable is a judgement call you have to make. Chances are good that WordPerfect can be had at a reasonable discount price; and if you are a student WordPerfect has their special student rate—under \$100. As for me, I can honestly say that I have no buyers remorse with this product. All it can do is get better.

The WordPerfect 4.1 For The Atari ST is available from: WordPerfect Corp., 288 West Center St., Orem, Utah 84057, (801)-225-5000. Not Copy protected. Sugg. Retail: \$395.00.

New Drive For Atari ST

Now THIS is how you build a disc drive! An all-metal case surrounds the NEC-built drive mechanism in Future Systems's GTS-100 3½" drive, and it's also QUIET—something that can't be readily answered by some of the drives Atari has shipped in the past. If you were looking to buy an Atari SF314 it

may be worth your time and money to look at this drive. If there are any sour grapes with the GTS-100 is that its index position readout isn't all that accurate (a nice trick, tho) and you may have to get the drive speed adjusted—the sure sign of this is some of your floppies won't read when inserted in the GTS-100 (this usually happens with mass-duplicated floppies: your originals may not read but your backups may). Depending on the price of this drive versus the Atari SF314 the GTS-100 may be a better buy. The GTS-100, does NOT like a 2 ms step rate and does NOT go beyond 80 tracks—so you are warned. Overall, it's a solid performer and deserves consideration.

The GTS-100 3½" Disk Drive Double-sided Double-density is available from: Future Systems, Inc., 21634 Lassen Street, Chatsworth, CA 91311, Sugg. Retail: \$249.00

File Edit Search Format Style Print Special

WordPerfect 4.1 - Doc 1 - Untitled

List Files

Parent (-)

Current Directory: A:\

File Name	Size	Date	Time		
CONSOLE.LRN	896	6-Oct-87	13:18		1. Retrieve
CRAFTS.LRN	808	6-Oct-87	13:18		2. Delete
FISH.LRN	212	6-Oct-87	13:18		3. Rename
GRAPH.LRN	1592	6-Oct-87	13:18		4. Print
HELP.WP	77312	6-Oct-87	13:11		5. Text In
NOTICE.LRN	585	6-Oct-87	13:18		6. Look
PERMITS2.LRN	493	6-Oct-87	13:18		7. Change Dir
PERMITS3.LRN	349	6-Oct-87	13:19		8. Copy
PRINTER.MAN	54031	7-Oct-87	10:17		9. Word Search
					0. Exit

Pg 1 Ln 1 Pos 10

WordPerfect Index

File Edit Search Format Style Print Special

Help

Atari 4.1

WordPerfect Help

10/1/87

Press any letter to get an alphabetical list of features.

The list will include the features that start with that letter, along with the name of the key where the feature is found. You can then press that key to get a description of how the feature works.

Press any key to get information about the use of the key.

Some keys may let you choose from a menu to get more information about various options. Press Help again to display this screen.

Press the RETURN key or SPACE BAR to exit Help.

WordPerfect Help Screen

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Be sure to see the review of LOTTO LOGIC in the August '87 issue of
COMPUTER SHOPPER! (page 212)

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Atari ST Outlook continued from page 307

communicates with external devices, as well as the 68000 chip itself, using a proprietary Basic Input/Output System. On the PCs, the BIOS was the only part actually patented by IBM; to manufacture a clone, you either have to write or manufacture your own BIOS. On the ST, the BIOS is based on CP/M 68K, while the hierarchical filesystem structure is based on MSDOS. Since all ST programs are "device-specific," they will only run on an ST.

The best way I've found to picture a UNIX/IDRIS environment by comparison is to imagine one of those animated cross-sections of Earth, like you'd see on "Nova," with a quarter cut-away showing the crust, mantle, magma, and core. Along the crust, walking around on the continents drifting along the magma, picture in your mind several people standing in a line, or a "queue," like in some poster for a fundraising effort, representing the processes.

The queue consists of interactive processes which are seen and manipulated by the user. The method of user interaction with these processes is considered the shell. These processes are "device-independent," and often-times are written in "pure" C. They'd run just as easily on ST IDRIS as on a PDP-11 mainframe.

These processes are adapted, however, by the "device-dependent"

or "specific" portions of the operating system, to run on its particular machine. The part of the UNIX/IDRIS OS that differentiates between the ST and the PDP-11 is generally called the "kernel." This contains all the tools necessary to generate output data in the proper format for devices such as the ST's monitor or Epson-compatible printer. It also breaks down device-specific output—like RS-232 output from a Hayes modem—into the more general UNIX format. One of the critical rules of a UNIX environment is that data are data. It's either legible by the OS, or it's garbage.

The "core" of the UNIX/IDRIS system is CPU-specific, but device-independent. 68000 IDRIS' core is a binary file, and only recognizes that CPU. The IDRIS core could be transported from an ST to, say, an Arete 1100 in about a few hours. Whitesmiths is the manufacturer of the ST IDRIS core; Computer Tools has developed the specific ST IDRIS kernel.

The Resident Is A Member Of The Executive Branch. . .

The IDRIS Executive system is divided into three parts: the device-specific drivers which allow IDRIS to drive the ST's peripherals (programmers may add to this set); the 68000 support system—what might otherwise be called the kernel; and the device-independent IDRIS "Resident," or the core of IDRIS.

Ted Sartell explains: "We sell an

IDRIS package that's designed to be ported to other people's special boards, their own hardware. It's an open system, as we sell it, with device drivers exposed so that you can write your own custom ones. The Executive and utilities and compilers are in there in binary form. You don't need to have the source to move it to other hardware.

"Computer Tools International out in Seattle were familiar with the Atari hardware; they were also UNIX gurus and IDRIS gurus. They said, What if we could put IDRIS on the Atari—this amazing combination of power and performance, with multi-tasking and the UNIX-like features of IDRIS? So they entered into a distribution agreement with us, and they undertook the port, and then we started working together on marketing it. We have a reciprocal agreement, where we both can sell that port. We both have been working together in identifying markets and talking with Atari about the product."

Skip Tavakkolian is a systems administrator and software engineer at Computer Tools, and is involved with the ST IDRIS project. He details how an operating Resident generated on an Omnibyte Multibus can be made to work so easily on an ST:

"We basically have a number of executable object files, which are assembler-generated for the 68000, with relocation information attached so that you can relocate them to different starting addresses. They don't

have the particular designed specifics, like the addresses in memory where they start executing, etched into them. The objects—the relocatable binaries—were generated on Omnibyte and HP 68000 machines.

"What we do," Tavakkolian continues, "is write device drivers—specific pieces of software that know how to talk to a device. The way UNIX talks to a device, it says, 'I have certain generic requests that this device needs to be able to handle, and I forfeit whatever special features that device may have. I forfeit them for the purpose of staying generic, and being a uniform interface.' IDRIS or UNIX needs to know how to write to that device, how to read from that device, how to position randomly on that device, or seek, how to open the device, how to close the device—even in logical terms."

The Resident contains a process prioritizer, or scheduler, which determines the order of the process queue, as well as the division of time elements between processes in the queue. A word processor, for instance, may require more run time than a spelling checker. The scheduler would understand this, since the word processor process would have called forth—or, to use the UNIX terminology, "given birth to"—the spelling checker. The word processor is thus referred to as the "parent" process, and the spelling checker the "child."

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This rather incessant spawning of processes can get quite complex. Suppose we were running instead a wind tunnel simulator, testing the aerodynamic flow around a projected automobile. One process might control the wind flow; another the structural "tensegrity," to borrow a Buck Fuller term, of the car; yet another the plotting of the wind flow to the monitor; another might judge the density of air molecules per cubic centimeter. We could go further: just how long is a cubic centimeter relative to the car? We'll need a process for that. What affect does heavy wind have on the shocks? New process required.

In a conventional microcomputer environment, you might imagine each of these spawned "child" processes as subroutines to the single, main wind tunnel program. While those subroutines are running, though, the wind must still blow; i.e., the movement of the wind is a real-time process, and should not be interrupted for a noticeable period of time. In a UNIX/IDRIS system, the wind generator process is given high priority, and is placed in a special real-time category. This way, whenever the wind is interrupted for processes like plotting or monitoring the shocks, the length of the interruption may be a small multiple of 250 milliseconds—the standard length of a "time slice."

What decides the priority levels of processes in a system for any given time? Skip Tavakkolian: "There's one routine called nice. It's a user-end utility [with which] you assign different priorities for a program. You can, prior to starting a routine, say, "I want the priorities set with this nice command." You have divisions from -20 to +20, numbers you can give it with -20 being the highest priority and +20 being the lowest. To set the priority, that would be something done in an ad hoc manner—something you'd want to do on the fly. As far as setting priorities in terms of control software—software that controls a robotic arm, where different components have to take precedence over others, otherwise the arm would swing too far and bang something—priorities need to be set programmatically. There is a system call to set priority, part of the real-time extension to IDRIS, that has priorities set in different fashions, and timers that say, "Either things happen in a certain amount of time, or you wake me up and let me handle things."

"There are for example, in terms of system calls, requests to the scheduler that say, "Attach the priority with each process," so that if a process with a higher priority needs to run, and it's not waiting for a disk request to get satisfied—like the DMA controller coming back and saying, "Okay, I've done it,"—then they're qualified to run, and they have higher priority over other processes that are qualified to run."

In a current UNIX environment, control is switched between processes by relocating the position of the program counter. Systems which can run UNIX contain a piece of hardware

called a memory management unit (MMU), which keeps constant control of the memory boundaries for each block of both process and data—considered together the image of a program or task. If the demands on a process "family" should change, the MMU could dynamically, or on the fly, allocate more memory, even transport a process or its data to an entirely new location, swapping locations with another dormant process.

IDRIS' scheduler logic acts as a replacement for the MMU—or as much a replacement as a software-

based system will allow. Still, a software-based alternative is bound to be slower than a real MMU; and it isn't convenient for the system to think of the scheduler as a separate software-based process.

Skip Tavakkolian: "The one thing that is definitely noticeable about a software MMU [with respect to] a hardware MMU is the free space that's given to each program prior to it executing. If there's not enough room in the default to satisfy what that program wants to do—maybe that program, after start-up, takes big chunks

of memory—then there is a command called setb, with which you increase the free space given to that program by whatever amount you want, up to the whole memory, the whole megabyte. At that point, things start swapping really bad.

"That's the major difference between a hardware MMU and a software, in that the hardware can dynamically give you free space—as much as there is—or you can set it up to do so; but with a software MMU,

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Atari ST Outlook continued from page 325

you have to say before executing the program, the default free space given to this program is not enough, so I want the default space for this program to be set permanently to 8 kilobytes, or 64 kilobytes, or whatever."

The IDRIS software-based scheduler relocates a process' image in memory during those periods in which that process is not running. Each file stored anywhere in the system contains a header, or inode, which contains information pertinent to how that file is to be relocated, as well as general file specifications. The scheduler performs mathematical redefinitions upon all direct memory addresses in that file—even absolute addresses—so that when a branch points to a new location, the operating system will recognize it as having been relocated.

Ted Sartell explains: "If you're running a multi-tasking, multi-user type of system, you want to be able to swap programs in and out of memory. You don't want to require—at least on the surface—that they run in the same place. They can get in each other's way. So you need some way, if you build an image with a compiler, you don't want to produce it as an absolute image that can only run at one location. You need the flexibility to be there, so that you can adjust as you're running."

One alternative to absolute addressing is the use of position-independent code (PIC). Veterans of Megamax C know this better as PC-relative code. In such a scheme, addresses are referred to relative to the current location of the program counter, as PC + /- x. Trouble is, with the limitations of the ST's 68000 CPU, the upper limit of x is 32K, which limits any memory

operation to a maximum of 64K. In the case of multi-tasking environments, 64K might very well become the limit of the entire system; the size of the IDRIS Executive is over 75K.

Ted Sartell explains the predicament and its solution: "UNIX systems... use virtual memory, needing even more advanced hardware. They've grown up, in terms of the complexity they expect in the underlying hardware. When you look at the Atari hardware and you see there's no memory management in it, you can put a PIC-type system on such as OS-9, or you can do it the way IDRIS does, which is that [the Resident] would relocate programs when they're invoked. They do run in the same place, but if you fork and exec [start a duplicate process in memory with separate data], our scheduler logic keeps things from getting in the way. At the time you create an image to run, you have the problem of how much stack space does it need, how much dynamic memory. On a true UNIX system, those things grow dynamically. Under IDRIS, the one constraint we have is that you must statically say, ahead of time, how

much memory you're going to allow that to grow within, and that's the size of the image we create for the process."

The memory-swapping software of the Resident can swap memory blocks between the bounds of internal memory—what we in the microcomputer realm would normally consider a "blit." When there isn't an available free block in internal memory to move a block to, it must have some external device available for use as a temporary memory buffer—in this case, a hard disk drive.

Skip Tavakkolian sees this as a potential problem: "With IDRIS, the swapping at some point will become a problem, especially when you are looking in terms of several tasks. This would be true both in the case of the hardware memory management being there, and it not being there. It becomes severe in terms of software memory management, where when you are forking a process—the process splits into two processes; it's the same text segment, they come from the same origin, but the data segments have to be different from there on. In IDRIS, what happens is that one of those processes gets swapped each time the other one is running.

"Somebody once made an example of disk access versus memory access, in terms of CPU cycles and actual real-world seconds. It'd be [the difference between] walking to a desk five feet away and picking up a pencil, and walking for thirty days and picking up a pencil. There are some very large time differences; where while the request for a process with a very high priority is being satisfied by the external world, there may be other processes that could become eligible, because the process with the higher priority is waiting for some outside event to happen.

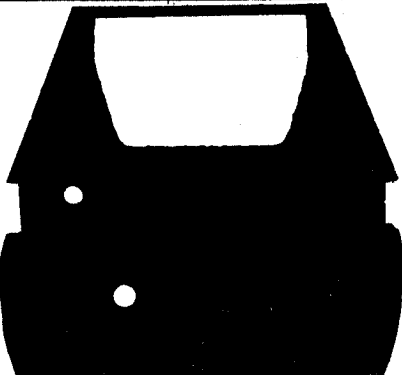
"When you get in the minority," Tavakkolian points out, "as far as real-time stuff goes—monitoring a nuclear reactor, for example, where your time slice has to be a lot smaller, where real-time is measured in terms of milliseconds and nanoseconds, rather than in terms of tenths or hundredths of a second—then at that point you would definitely need the specialized hardware to be there that could give you such smaller increments."

How To Drive An ST

The IDRIS Executive will contain a different hard disk device driver—one which won't slow down as the disk gets fuller. The objective of this driver will be to minimize head movement by reducing the amount of linear searches it has to undergo.

Computer Tools is creating new ST device drivers for IDRIS using a non-standardized UNIX utility called ioctl—short for "I/O control"—which is a "catch-all" request to whatever external device may be connected to the system at the time. One such IDRIS ioctl request is to format the ST's floppy disk, for whatever size, density, or tracks-per-sector. The ioctl library utility is a request to a device to perform an operation whose description

continued on page 328



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COMPUTER SHOPPER

Atari ST Outlook continued from page 326

is specific to its device driver. You may format, for instance, a disk, but not a terminal.

Skip Tavakkolian takes us through a typical ioctl scenario: "There's a command called cat in UNIX/IDRIS, which basically concatenates. It's used like a typed command in an MSDOS environment, for example, or a CP/M environment, to see what's in the file. So it's "cat," and then a filename. At that point, the shell gets the request to run the cat program. The cat program looks at the filename that was specified, and it says "open." At that point, open is a system call. The operating system, IDRIS/UNIX, looks at the request and says, "Okay, let me see, what is it? Is it a terminal, or is it a disk file, or is it a pipe event?"—which is temporary, one-directional data stream, the standard UNIX pipe.

"Suppose the filename ended up be-

ing a disk file. It's an open request for this device, so it calls the strategy routine. That strategy routine [says there are] no specifics for that device. Then the device driver says, "In order to open, I've got to tell the controller, Put this value in this special location in memory," and then wait for it to change; then I know I have the attention of the disk controller. Then I put these values in these locations in memory. . . Those special values that I put in there is whatever I tell the disk controller, to open that device or open that file."

"In general," Tavakkolian continues, "these requests—open, read, write, close—may or may not make sense. You can't seek a terminal. You can read a hit and put it in the buffer; but you can't really seek on a terminal. There's nothing [there] beyond whatever the user is typing. So there are certain requests which only have a null action associated with them. So not all the requests may make sense

with that device; but they're all handled in a unified fashion.

"First, the open request gets passed because it's a system call to the operating system. The kernel looks at it, says it's for this device, and calls the strategy routine for that device, and gives it the open request for that location on the disk. The device driver comes back and says, "Okay." Then the user program continues now that the system call—which was open—has returned [control] back to the user program. So the next few instructions may say, "While not in the file, read the file." For every read, that's a system call. It gets translated into, "This file, I know, is associated with this device, and this is the interrupt dispatcher, so I'll call the strategy routine for this device, and I'll give it read requests." The read requests are in terms of, "the user wants to read five thousand bytes." The device driver says, "Get the addresses." [It then says] to the DMA controller, "Give me this chunk of data from the disk and put it in this area." Then when that device driver returns back [to the system], and the system call returns back to the user program, that read request has been satisfied.

Tavakkolian points out, "The user program—that cat program—will stay the same. If you told it to "cat/dev/tty3," for example—that is a special file which is like a "hook" point or a mounting point for a terminal—the operating system looks at it, says,

"Ah, this is a terminal!" The strategy routine says, the device driver for this device is different than for a disk, so I've got to call [the terminal driver] and open the terminal, and wait for it to read." The user program stays the same, because it doesn't care what it's reading so long as the device drivers [know]."

A unique feature of IDRIS is that it accesses common data segments—blocks of data in use by all processes—as virtual devices. This way, a 32K block of memory can be recognized not only as screen RAM, but be accessed as the screen device itself. This physical accessibility of logical space is the natural result of segments, files, and devices having uniform "handles." In other words, the system kernel can read a data segment from memory just as easily as from disk, as well as schematically from a terminal.

As for plotting the output data to the screen, one can imagine the confusion that has resulted when several independent processes vie for control over some part of the same screen output device. MIT's solution is a special screen device handler process called X-Window. In our next edition, we'll examine this windowing process, parts of which will be familiar to GEM programmers, along with a look further into scheduling logic, UNIX utilities, and the future of IDRIS for the ST.

That's Outlook for this month. I'll see you on Delphi.



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